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The Refrigeration Service Engineer

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Vol. 7
No. 3

MARCH • 1939

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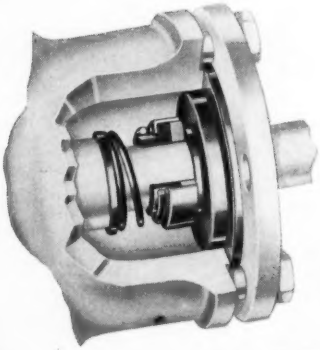

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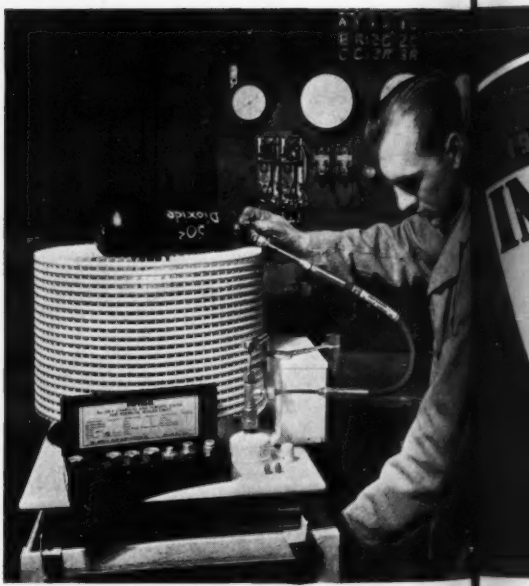

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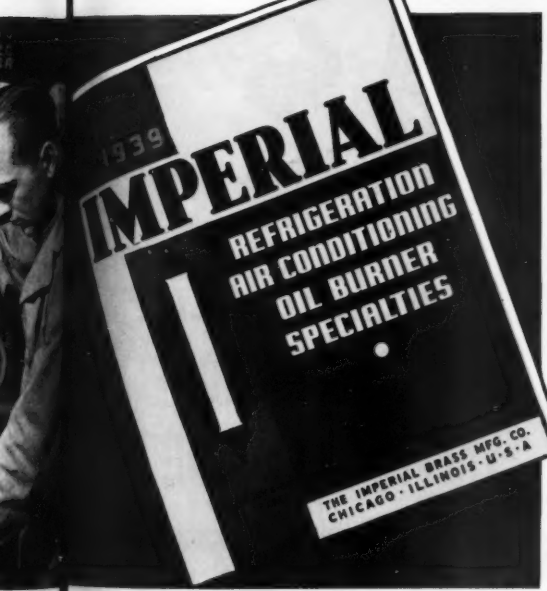

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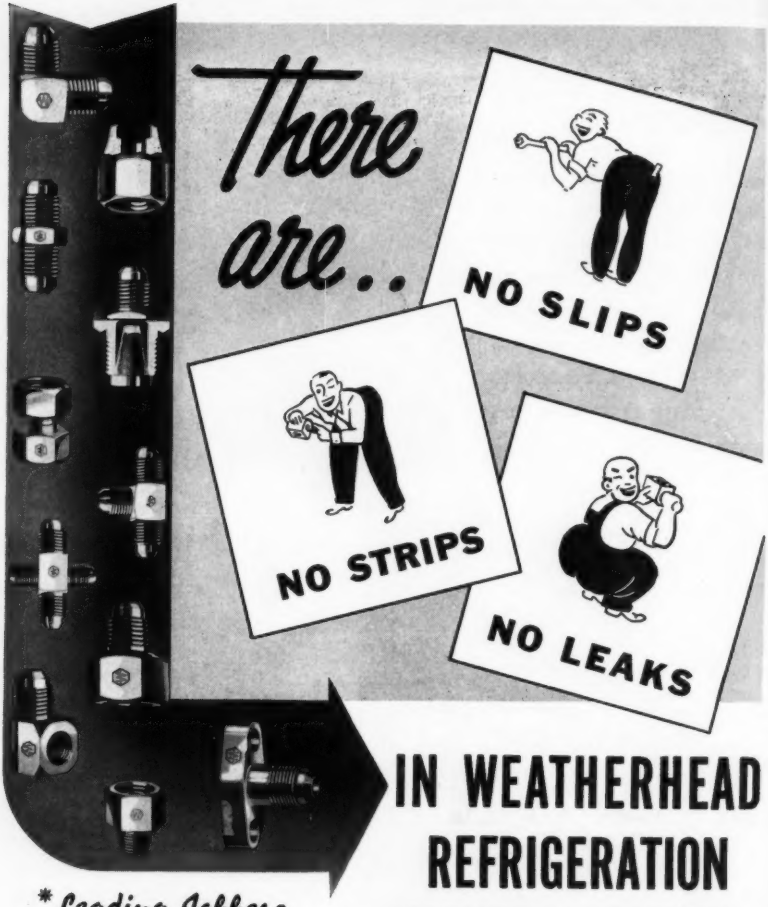

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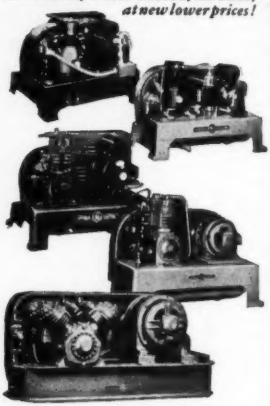

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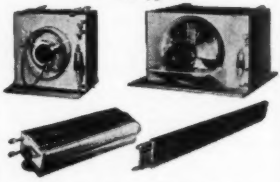

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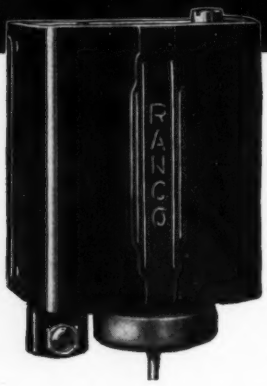

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The Refrigeration Service Engineer

Vol. 7 No. 3

March 1939

A Monthly Illustrated Journal Devoted to the Interests of the Refrigeration Service Engineer in the Servicing of Domestic and Small Commercial Refrigeration Systems and Oil Burners

Official Organ
REFRIGERATION SERVICE ENGINEERS SOCIETY

Cover

Here are two views of a very modern service shop, equipped for every class of work, including hermetics of all makes. Windows on all four sides, plenty of space around the equipment, and neat orderly arrangement contribute to higher efficiency in work. The shop is part of the space occupied by the Refrigeration Maintenance Corp., Chicago, Ill.

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TABLE OF CONTENTS

Maintenance of Refrigeration and Air Conditioning Equipment, *by H. R. Jaeggli* 11

Building a Refrigeration Analyzer (Second Article), *by Edw. N. Avery* 14

Cleaning of Metal Surfaces 17

Field and Shop Data on General Electric Refrigerators (Third Article) 18

Moisture in Refrigerating Systems, *by E. W. McGovern* 23

What Superheat? *by Geo. H. Clark* 28

Question Box 34

Comments on Questions 235 and 294 34

The Schaefer Malted Milk Machine 34

Adjusting an Air Conditioning Job 35

Winners of the Service Kink Contest 36

Reverse Cycle Air Conditioning System 36

R.S.E.S. News 37

A Request from our Educational Director 37

Kansas City Chapter Annual Banquet 37

Vox Pop Contest Makes Interesting Meeting for Los Angeles Chapter 38

Mississippi Valley Chapter Annual Banquet 38

Springfield Chapter Dinner Party 40

Chapter Notes 42

Manufacturers' News 52

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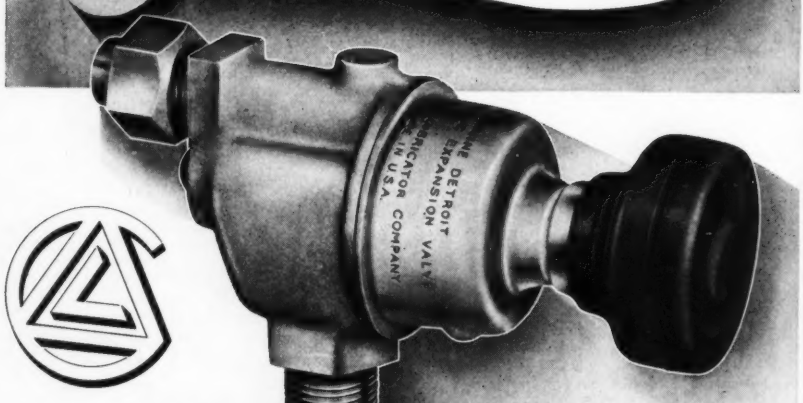

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The Refrigeration Service Engineer

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Maintenance of Refrigeration and Air Conditioning Equipment

By H. R. JAEGGLI*

THE subject of maintenance of refrigeration and air conditioning equipment, while it is of prime importance, has not had as much attention as it should. Just why this is so I have been unable to definitely determine. Perhaps it is because most systems are automatically controlled and since they are automatic, we become forgetful that they need attention. Perhaps we do not realize that each small part has a definite relationship to the functioning of a satisfactory air conditioning system, or then again the subject may not have been presented in such a way that we realized its importance. I am going to let you be the judge.

Let us draw a comparison. When we buy an automobile, we expect as a matter of normal procedure to drive it to a service station to have it greased, filled with gas, have the oil changed every 500 or 1000 miles, and occasionally to a garage for a general check-up. An air conditioning system is comparable. It contains moving parts which need attention. There is one difference, however. We cannot drive it to a garage so we must bring the workmen to it. That is where we are remiss.

Purchasers have invested large sums of money in their systems. To protect that investment a definite maintenance routine should be established just as is normally set up for any other piece of equipment. It is amazing how much material fails because of abuse and neglect in the field. Examination very quickly discloses that fact.

Again refer to the automobile in comparison. Your automobile engine normally does not run more than two hours a day but your refrigeration compressor may run constantly 8, 10 and even as much as 16 hours a day. The starter motor in your car may be used five or ten times as compared with an automatic starter on a compressor which may be called upon to function a hundred times, while a fan bearing never stops until the system is shut down for the day. Many more comparisons could be made.

An air conditioning system may be considered as consisting of two parts. One—the refrigerant circuit which should only be serviced by men experienced in this line of work. This circuit consists of the com-

*Carrier Corp., Syracuse, N. Y.

pressors, condensers, evaporators, controls, etc. Two—the air handling circuit made up mainly of fans, motors, dampers, filters, etc. which any maintenance man should be able to periodically check. It is a simple task to prepare an inspection check list for your maintenance department to follow.

In general, the things to check in a refrigerant circuit are oil circulation, expansion valve adjustment, piping and machinery for leaks, control settings, etc.

Refrigerants Used

The predominant refrigerants used in air conditioning systems belong in the halogen group. Most common of these are Freon, methyl chloride, Carrene, etc. Oil is miscible in all proportions with these refrigerants and it is very important how much oil there is in circulation because dilution of crankcase oil is an important factor in the life of a reciprocating compressor. On first thought you would say it is better to have an excess of oil. That, however, is not the case because oil in circulation in a system always carries large amounts of refrigerant with it. Diluted oil will create a bad condition in the crankcase. This is almost as destructive as a too widely opened expansion valve which will allow liquid refrigerant to flow back to the crankcase.

The indications of excessive oil in circulation are a foamy condition of crankcase oil as observed through the bull's-eye, cool or sweating crankcase, and heavy concentrations of oil in the refrigerant liquid when tested at the liquid level test cock. These checks should be made only after the system has been operating for 20 to 30 minutes at which time you get normal running conditions. Crankcase temperatures should run from 100 degrees to 130 degrees F. (approximately).

Proper expansion valve adjustment calls for refrigerant vapor, leaving the evaporator, having from six degrees to 12 degrees superheat.

Refrigerant piping, as well as compressor and coils, should be periodically checked for leaks. A good Halide torch is used for this purpose.

Pressurestat settings and oil pressures, if the compressor has forced feed lubrication, should be checked. Gauges should not be allowed to register continually but should be closed off after tests to prevent damage to gauges and possible loss of refrigerant charge.

It might be well to touch on the subject of condenser water at this time for general information. It should be interesting, whether water-cooled or evaporative condensers are used. Good waters will enable the apparatus to operate satisfactorily for long periods; others will cause trouble from corrosion or scale deposition.

Water may be classified as from four sources:

(1) Surface water in rural districts which experience indicates is usually the best.

(2) Municipal water taken from good sources usually chemically treated to make it satisfactory.

(3) River water in industrial areas, often contaminated by trade waste which may be corrosive.

(4) Well water, particularly from deep wells, is usually harder and often causes trouble from scale deposition and dissolved gases.

Analysis of Water

An analysis is often enlightening and may at times save a lot of trouble. Of interest are color, odor, suspended matter, pH, silicon, iron, alumina, calcium, magnesium, carbonates, sulphates, chlorides, total hardness, dissolved oxygen and carbon dioxide, etc. A water for condensing purposes should have a pH of from 7.5 to 8.5. The lower the pH value, the higher the concentration of scale forming material that can be held in solution without precipitation. Calcium carbonate and magnesium chloride are the most objectionable because of the low solubilities at low temperatures. The U. S. Geological Survey classifies municipal water supplies into four groups:

A. Less than 60 p.p.m.—Soft
B. 60 to 120—Fair
C. 120 to 180—Hard
D. Over 180—Very Hard
Expressed as Calcium Carbonate

Softening treatment is usually recommended for classes "C" and "D" when used for evaporative condensers and class "D" for shell and tube condensers. The treatment of water should be referred to water treatment specialists.

Of interest are the methods for removal of scale. On water-cooled condensers having shell and tube condensers, the inhibited acid method is most satisfactory and is comparatively easy. The removal of scale deposited on the tubes of evaporative con-

densers, however, presents a difficult problem. The following methods of scale removal have been used with varying degrees of success:

1. Operate the condenser without any spray water in an effort to heat and crack the scale so that when water is again turned on, the scale will be removed by the spray and will be washed into the drip pan. This method has been fairly successful where the scale is hard and can be cracked.
2. Spray the tubes with a ¼-inch stream of water under a pressure of about 75 pounds.
3. Submerge the condenser coil in inhibited acid (hydrochloric acid with phosgene GN inhibitor) after it has been removed from the unit. This is a lengthy job and has the disadvantage of making it necessary to pump down the system and open the refrigerant circuit to the atmosphere. Adding inhibited acid to the spray water is not advisable. The scale will be removed but so will the galvanizing and rusting of the whole unit will result.
4. The most satisfactory method of keeping the tube surfaces clean is to remove the scale forming substances by water softening treatment before the water is used. It, therefore, is not a cleaning method but a preventative.

Draining the Condenser

Protection of condenser, and water coils used for precooling against freezing temperature, can best be accomplished by blowing out with air or circulating antifreeze solution through the coils. Extensive tests and experiments upon a wide variety of water coils used on air conditioning equipment have been made and it has been found that no small tube coil even though level can be depended upon to completely drain itself. The residual water must be blown from the coil. Blowing out coils cannot be accomplished with compressed air through a small connection because of the volume of air required. A blower which will supply 150 c.f.m. of air at four inches water gauge pressure through a two-inch connection is satisfactory for properly purging a bank of three coils in parallel. Multiples of that air quantity will be satisfactory for multiple banks of coils. Blowers for this work can be of the portable type or can be made a permanent part of the installation.

Protection of the air handling portion of air conditioning equipment is much simpler. Bearings must be greased, motors oiled and belts tightened. Filters and spray nozzles must be checked and cleaned as any variation in calculated air quantity and humidity will seriously affect conditions. There is also the usual painting, and cleaning of drip pans so often neglected, to be done.

It might be advisable to touch very briefly on the use of chemicals to eliminate odors. Inasmuch as one of the functions of a good air conditioning system is to remove dust and foreign matter from the air, it follows that in certain places some of this foreign matter may be of such nature as to grow or ferment and thereby produce odors. The need for some chemical or substance with which to correct this condition and with which to clean air conditioning equipment has long been recognized but only recently forthcoming.

There has been a flood of extravagant claims of things accomplished with such chemicals. Data has been and is still being collected but at present no definite conclusions have been reached. We can give the following facts. Any material which is used in conjunction with water, through which air is supplied to a conditioned space, must, of course, be non-corrosive and must produce no slime. In an instance where water softening treatment is used before such water is passed into the system for make-up water, naturally any disinfectant must be compatible with the softening material. Bactericides must be non-odorous.

It is hoped that this very condensed presentation will indicate in some measure the importance of maintenance. A book could be written on the subject and still not fully cover the many phases of maintenance.

S S S

Wm. J. Blake
New Jersey

I do not wish to give up my subscription to THE REFRIGERATION SERVICE ENGINEER, copies of which you send. I think more of it than any other thing I receive.

Lee Sunderhaus
Ohio

Enclosed find $2.00 money order for renewal of my subscription to THE REFRIGERATION SERVICE ENGINEER, which is always so instructive and helpful.

Building A Refrigeration Analyzer

(Continued from the February issue)

This is the second of a series of three articles on the construction of this instrument. This article contains completed construction details. In the next issue the author will conclude this series and describe methods of using the instrument.

The Electrical Instruments

A 0-10 amp. ammeter was mounted at (13) and a 0-150 volt voltmeter was mounted at (14), both instruments being made for alternating current. Since removal of these meters would also require removal of the panel from its case in order to reach the wiring, they were mounted by simply passing 6-32 brass machine screws through holes drilled out in the panel and nuts were placed on the other side.

A panel illuminating light was placed at (17) and since such devices vary widely in their dimensions no size for this hole has been given.

A motor base was placed at (1), as the 110 volt input to the panel, and as connection to it is made by a Bakelite cord connector body, all danger of shock or short circuit is avoided.

An eight-day automobile clock was then added at (15).

The General Electric Timesaver line was selected for the various outlets, switches, etc., because they were available in almost any combination and were also small and neat in appearance. Numbers (2)-(3)-(4) and (10)-(11)-(12) are each three convenience outlets in one group and must be taken apart and the internal jumper removed which then makes each outlet a separate circuit from all others in the same group.

Number (5)-(6) is a combination pilot light and single-pole switch in one group. This switch must be taken apart and the switch parts exchanged with those of the three-way switch. This is done so that the three-way switch, while in the off position, will disconnect the ammeter and restore the circuit through its other connection.

Number (7)-(8)-(9) was originally a unit of two single-pole switches and one three-way switch. The three-way switch was removed and used as above and a double-pole switch of the same type which was purchased separately was placed in its position.

All of these items may be purchased from General Electric in any combination desired upon special order, but since time was a factor and the extra switch cost but little, the writer made what few changes were necessary.

Number 14 gauge rubber covered wire was used in following out the wiring diagram given in Fig. 4. Since loose connections are not only annoying but also are frequent causes of errors creeping into testing instruments, care was taken to solder each wire to its proper post.

From Fig. 4 it will be noted that when switch (7) is in the off position, the voltmeter is entirely disconnected from the board circuit and may be used by plugging into outlet (3) without any danger of blowing a fuse even when the panel is alive.

Switch (6) is used to disconnect the ammeter during the motor starting period as the heavy starting current would damage the meter.

It will also be noted that outlet (2) is alive whenever the panel is alive and may be used for extension lights, etc.

Outlet (4) is used to make connection to pilot light (5) and comes in handy when a visual indication of voltage is desired in making point to point tests.

Switch (9) controls the flow of current to outlet (10) and is usually used to start and stop the unit under test.

Switch (8) is used to control panel light (17) as well as outlets (11) and (12) which are used for extension lights or other similar devices.

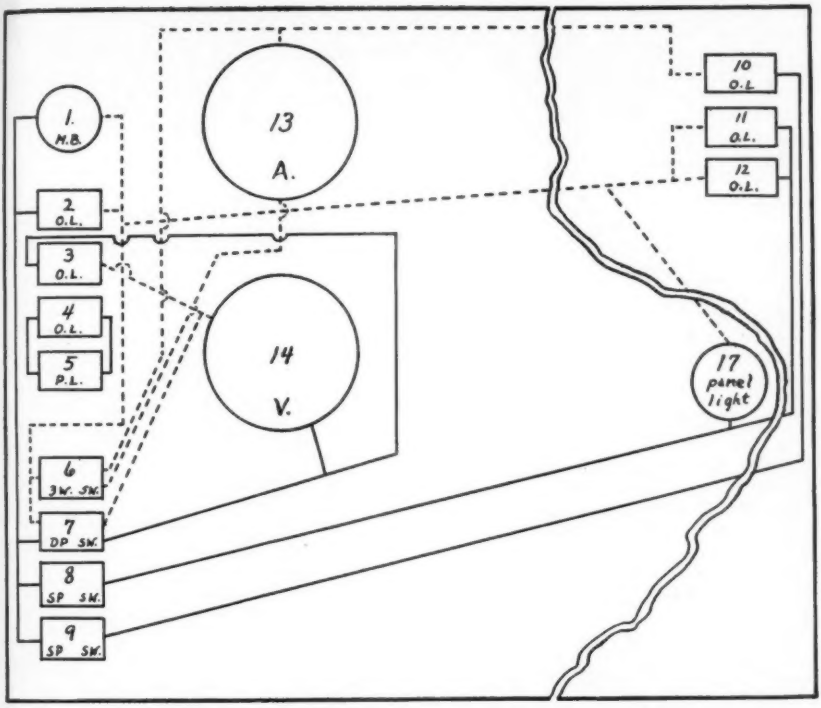

FIG. 4. WIRING DIAGRAM FOR THE REFRIGERATION ANALYZER.

1. Motor base connector.
2, 3, 4, 10, 11 and 12. Convenience outlets.
5 and 6. Combination pilot light and single-pole switch connected to a three-way switch. The light and switch are in one group.
7, 8 and 9. Single unit of three switches.
13. Ammeter.
14. Voltmeter.

The Case

All dimensions for the construction of the case are given in Fig. 6. This plan was turned over to an experienced cabinet maker with orders to build one. Unless the builder has had experience along these lines and possesses the necessary tools and equipment, the writer would suggest that this work be let to someone in a better position to build it.

As will be noted in Fig. 5 the cabinet is built in two sections, the thinner or bottom section containing the analyzer proper, while the thicker or upper portion is divided into ten compartments with a lid covering them. All the electrical cords listed under accessories are carried in these compartments.

Plywood was used throughout in the construction of this case, all sides being ⅜ inch thick, the top and bottom 5/16-inch thick and the divisions between the compartments and the lid covering them being made of ¼-inch material.

Plywood was selected as the proper material to use since it was light in weight and still possessed the necessary strength to stand up under any abuse which the case would normally be expected to receive.

Plywood is not only able to stand severe shocks without cracking, as would other forms of wood, but also will not dent as would sheet metals in the necessary thinness required in order to maintain the same weight.

Plywood's ability to take almost any finish desired was also a deciding factor in its selection.

As all joints are of the half-lap type and are securely glued together with waterproof glue, they add materially to the strength.

A piano-type hinge was used to fasten the two halves of the case together and allows it to open up like a suitcase. This construction places the analyzer in the proper position before the unit being serviced and makes all the electrical cords instantly available when needed.

The interior of the upper half of the case

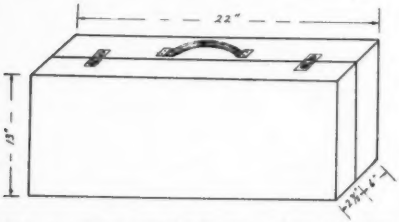

FIG. 5. THE COMPLETED CLOSED CASE SHOWING OUTSIDE DIMENSIONS.

was painted with aluminum paint so that the various electrical cords could be easily distinguished even in dim light.

The balance of the case was first stained a light maple. After drying and sanding, two coats of clear Dulux were applied, allowing a 24-hour drying period between coats.

Metal corners were then applied over each corner, using the small escutcheon pins furnished with them to fasten them in place.

Two small snap fasteners were employed to hold the case in the closed position, while a leather handle, properly placed to balance the case nicely, provided a means of carrying it about.

Twelve small rubber buttons were used to keep the case from making contact with the floor, four being placed on the bottom, four on the top and the other four were applied to the rear side which becomes the bottom when the case is set in an upright position.

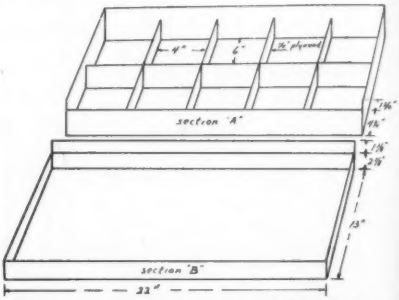

FIG. 6. DETAILS OF THE CARRYING CASE. The inside cover of Section "A" is made of ¼-inch plywood. The bottom is made of 5/16-inch plywood set inside of the sides. The sides are of ⅜-inch plywood. The sides of Section "B" are of ⅜-inch plywood and the bottom of 5/16-inch plywood. A ½ x ½-inch wood strip set down 1/16-inch from the top is fastened around the interior of this section to provide a mounting rail for the panel.

Accessories

In order to avoid confusion, later on all accessories will be numbered and all future reference to these articles will be by number.

(1)-(2)-(3)-(4) and (5) are extensions with a male cap on one end and a Bakelite cord connector body on the other, their

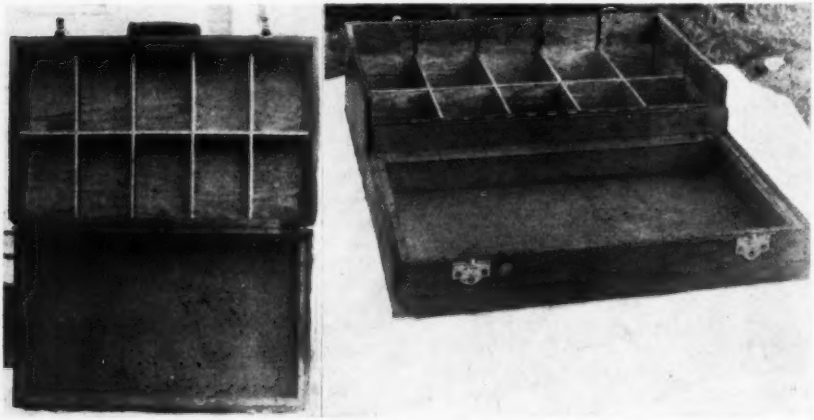

FIG. 7—TWO VIEWS OF THE CASE READY FOR MOUNTING OF THE PANEL.

length ranging from six feet to ten feet. While this may seem an excessive quantity of extensions of this type, the writer has found that this is the minimum number that will suffice. These extensions may be used to lengthen out any other extension.

Number (6) is an eight-foot cord with a male cap on one end and a three-way tap on the other.

Number (7) is a two-foot cord with a male cap on each end. Number (8) is a two-foot cord with a Bakelite cord connector body on each end. These two cords may be used to couple any two extensions together, etc.

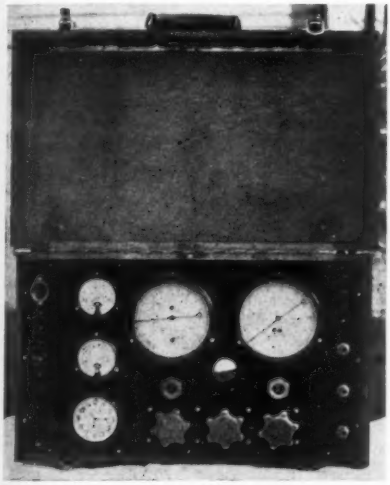

Fig. 8. A view of the completed instrument with the inside cover closed.

Number (9) is a six-foot cord with a male cap on one end and insulated test clips on the other.

Number (10) is a six-foot cord with a male cap on one end and insulated test prods on the other.

Number (11) is a six-foot extension light with a small guard soldered directly to the brass shell of the socket and is equipped with a 15-watt globe.

Number (12) is a small pencil type extension light (purchased in a local radio store) using a radio dial bulb, and since the extension cord is a radio line cord resister it may be safely plugged into 110 volts. This extension is very useful in peering into small motor openings, etc.

Number (13) is a cube tap with male prongs. Number (14) is a female plug body.

Number (15) is a keyless kitchen tap.

Number (16) is an acoustical tester made from an old radio receiver and built to Mr. Wayne's specifications given in his article in May, 1937 REFRIGERATION SERVICE ENGINEER. The brass rod, in this case, is divided into three sections and can be unscrewed so that it may be stored in a small space.

Number (17) is a short-circuited male cap. Its use will be described under Service Operations.

All the above are carried in the ten compartments in the cover of the case.

Three flexible charging hoses are also required, one being carried in the tool kit and the other two are left attached to the connections on the analyzer and are coiled up on the panel.

In the April issue the author will describe in detail how the instrument can be used and what tests can be made with it. Construction details are complete with this issue.

CLEANING OF METAL SURFACES

IT is often difficult to remove the carbon and other accumulation which may be found on the metal surfaces of compressors under repair. The first step in the cleaning process is the removal of oil and grease. This can be readily done by boiling the parts in a strong solution of Oakite or lye for a period of one-half to one hour.

After removal from this bath, the parts should be rinsed in clear hot water so that none of the first bath will be carried over to the second bath.

The second bath consists of a 50-50 solution of muriatic acid and water, which should be kept in a stone crock or other container, which will not be attacked by the acid. This bath is termed "bright dip" and the parts should be submerged in it while hot from the previous bath. Brass and copper parts may also be cleaned in this bath.

The time required will be from four to five hours, depending on the condition of the parts and the bath. Upon removal, rinse off in clear hot water and allow to dry. Use care in handling muriatic acid even though it is in a diluted state; avoid breathing the fumes while working with it; keep the container covered at all times; keep the container in a well ventilated space and wear goggles while working over it to avoid contact with the eyes through splashing.

Field and Shop Data on (THIRD ARTICLE)

General Electric Refrigerators

This concluding article on G. E. Units describes additional field service methods, shop routines and repair.

Noisy Operation

FOR the first several hours of operation, after a long idle period, the unit may be quite noisy. This may be eliminated by connecting the unit to the outlet, but leaving the manual switch in the off position for two or three hours, thereby permitting the oil conditioner to warm the oil before starting the unit.

If the noise persists after about two days' operation, check the following:

See that the refrigerator is level and resting on a solid floor. Partitions, brooms, pans, etc., which may be in contact with the refrigerator may act as a sounding board for vibration, or create a rattle.

Check the oil conditioner with a test lamp in series with it to determine whether or not it is operating. The lamp will glow dimly if it is okay. If it is not working, replace as follows:

Remove the name plate from the front of the base and remove the rubber plug from the opening underneath it. Using a small wire hook, the conditioner leads may now be pulled out and the conditioner pulled out of the tube. The leads may be cut about six inches from the conditioner, and the new conditioner leads spliced on. In replacing, the rubber plug should be carefully placed in position, so as to prevent the entrance of moisture at this point.

A shortage of refrigerant in the system will cause oil to leave the compressor and become trapped in the evaporator. The compressor will be noisy, due to a shortage of oil.

If the float housing and condenser are approximately the same temperature, indicating the float is not bound, and if the evaporator frost line is low, try adding gas until the frost line appears on the suction line. The oil should then return to the compressor and the noise subside.

Other symptoms of trouble due to noise may be described as a "vibrating burr," "continuous pumping noise," "dancing check valve," and "partial refrigeration." A "vibrating burr" may be further described as an intermittent burring noise, which rises to a maximum tone, stops, and then rises again. The noise periods may have a duration of anywhere from one second to continuous.

A "continuous pumping noise" may be described as a metallic sounding pumping noise, similar to that when the unit is first started up. A "dancing check valve" is an irregular, light metallic tapping.

When "partial refrigeration" occurs, the unit is found to run all or most of the time. The evaporator will frost lightly, or not at all. The float and condenser will be about the same temperature. "Partial refrigeration" will be the last of the symptoms to show up, and indicates an advanced stage of the trouble. The other symptoms will be indicated in the order named.

To correct this trouble, it is necessary to create violent boiling action in the evaporator. This may be accomplished by removing the unit from the box, and placing on a support that will permit the unit to be tipped. Allow the unit to thoroughly defrost before proceeding, then cover the waxed portion of the suction line with a wet cloth to prevent it from melting. Next, with the unit running, apply heat to the evaporator and at the same time tip the unit forward to an angle of about 30 degrees from level. The unit must not be tilted beyond 30 degrees while it is running. Damage to the mechanical parts may result if it is.

Allow the unit to run in this position, and apply heat for about 20 to 30 minutes. Then, return to normal and replace in cabinet. Due to the high compressor temperature that will result, the pumping noise may continue for about two hours.

If the noise continues to an objectionable degree, and does not respond to this treatment, it will probably have to be taken to the shop for replacement.

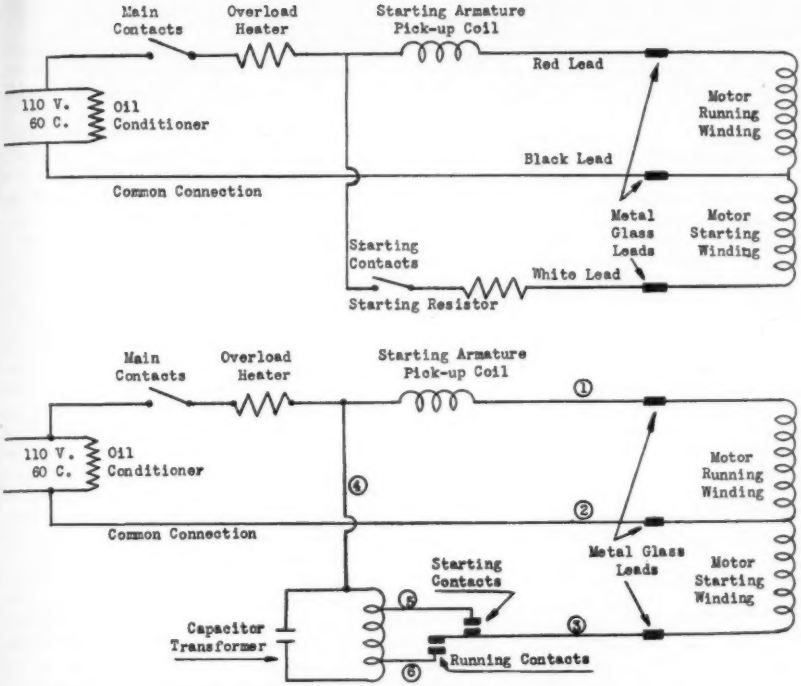

FIG. 12—WIRING DIAGRAMS FOR G. E. UNITS
Upper—1050-A or 1050-C Control. Lower—1050-A or 1050-C control with capacitor transformer.

Partial Refrigeration

In general, partial refrigeration may be due to control troubles, as described under "Erratic Refrigeration" to oil displacement, which is remedied with the heat treatment described under "Noisy Operation" or to a lack of refrigerant in the system.

Symptoms of a shortage of refrigerant are continuous or too much running, and a partially frosted evaporator. In order to add gas to these units, it is necessary to secure a special charging adapter to fit in the charging connection on top of the float valve. Gas should be added, and the unit run alternately, until frost appears on the suction line and remains about two inches from the evaporator.

Oil or Gas Leaks

Sulphur dioxide leaks may be located in the usual manner with an ammonia swab. Small leaks, which cannot be located in this manner, yet are suspected of causing bad tastes in food, can be located with blue litmus paper.

When the leak is located, it should be soldered or tapped, if it is possible to get to it. To do this, it may be necessary to discharge all the gas in the system and recharge after the repair is made. Discharging should be done slowly through the charging valve in the float so that as little oil as possible will be carried with the gas.

If oil leaks around the base of the unit, there is nothing you can do in the field, and the unit will have to be replaced.

Oil leaks at the back of the evaporator on the DRA-2 and DR-2-E units may be due to a loose fusible plug, which should be tightened or replaced. These evaporators contain oil as a holdover solution.

Shop Repairs

The foregoing describes methods of locating and adjusting troubles which may be taken care of in the field. Once the trouble has been definitely determined as being in

the compressor or motor (both of which are sealed in the compressor dome) the job can be designated as a shop repair. Any mechanical trouble within the dome or the float housing constitutes a shop overhaul, which in comparison to field service will be of a lengthy and more extensive nature. Therefore, it is advisable at the outset to replace the unit temporarily, or as a permanent exchange, quoting the customer a flat rate for the exchange of the unit. Due to the cost of this type of repair, the customer is justified in expecting some guarantee on the work, and if the work is done by a reputable concern, this guarantee can be, and will be, backed by them.

When the unit enters the repair shop, it is of no interest to determine exactly what is wrong with it. Its failure may be due to a leaky discharge valve, or to a burned-out motor, but because it will cost nearly as much to open the unit and repair one as the other, and the shop cannot take the chance of something else going wrong within a short time after the unit has again been sealed, the unit is completely overhauled and all parts put in first-class condition while it is open. Thus, the job becomes a remanufacturing process rather than a service job. These differ in that a service job constitutes a repair to an individual part or trouble of the moment, while rebuilding or remanufacturing is a process of repairing, replacing or compensating for all wear or deterioration that has occurred to all or any part of the unit. Thus, it is evident that a flat rate, with the exchange policy on hermetic units, is the only satisfactory system of handling.

Shop Routine

Upon receipt of the unit, the first step in the routine that it will follow is a thorough check for missing or damaged parts which may require replacement. Notation is made on the unit record of all conditions, for the purpose of billing on a replacement unit, or the return of the old unit. The real work on the unit begins at the purge room, where the unit is completely evacuated. Among the volume of units passing through this process will be found those in almost every imaginable condition. Some will contain water, others carbon and black sludgy oil, and some will contain nothing but pure oil and refrigerant. For this reason, it is necessary to use special evacuating pumps which will not become stuck up due to the moisture and carbon passing through them.

The unit shown in Fig. 3 is of the bolted-type and presents no particular problem in its dismantling. This was the first model manufactured, and all succeeding models were of the welded type; therefore, we will be primarily concerned with the welded type. In dismantling, the line between the float and condenser should be cut about six inches from the float. The suction line may be cut midway between the evaporator and the cabinet top. This will permit easy access later for splicing these lines. Spot welds will be found at about four points where the compressor dome is fastened to the steel cabinet top. These should be carefully broken with a chisel, taking care not to distort the top of the cabinet so the appearance of the finished job will be spoiled. Disconnect the wires which lead from the control. The compressor dome is now removable from the cabinet top. The dome is then placed in a lathe with extended chuck jaws and the original weld carefully cut away and the dome cut through at this point. The cut should be made in a V-shape, which will facilitate rewelding after the job is completed. After removal of the dome housing, the compressor assembly is dismounted from its spring mountings, and taken to the compressor repair department. Here all parts are thoroughly inspected under magnifying lenses and checked with micrometers and standard gauges for wear or misalignment. Rejected parts are replaced or, if possible, remachined. A new motor winding is installed to replace the old one.

Cleanliness Very Important

Cleanliness is one of the most important factors in the rebuilding of these units, and extreme care must be taken to eliminate any possibility of lint from the motor winding, and cleaning rags, or any other possibility of dirt being left on the parts when assembling, which may circulate with the gas and oil and possibly clog fine screens and orifices. For this reason, all parts before assembling are cleaned in bright dip acids, and then rustproofed. Motor windings are singed to remove any lint that may have become ruffled during the process of winding. No rags or waste are used in the cleaning of parts.

The compressor and motor are now ready for reassembly and preliminary tests. The first tests are conducted with temporary suction and discharge connections made to the compressor, and consist of a volumetric test

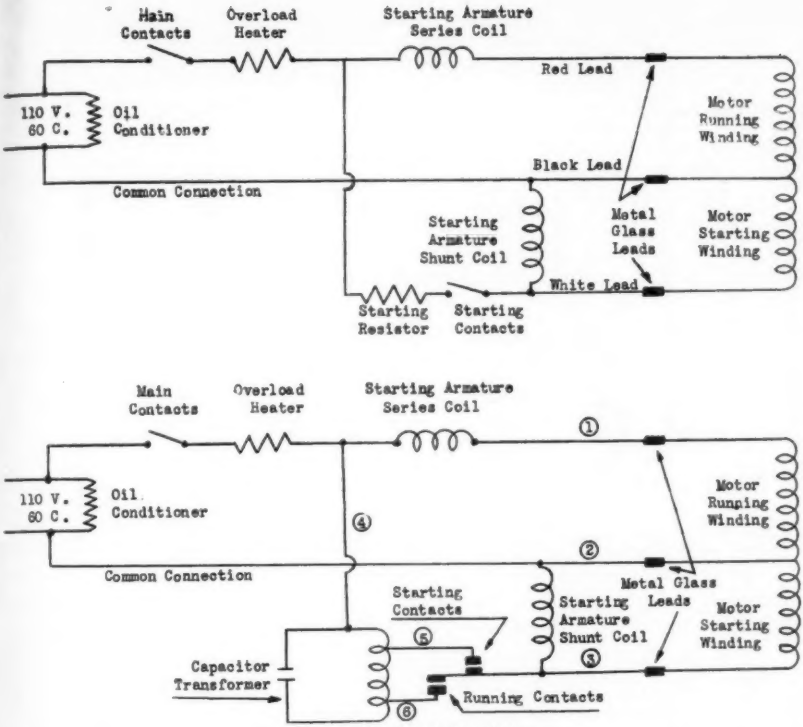

FIG. 13—WIRING DIAGRAMS.
The upper diagram shows wiring for the 1050-E control without a capacitor. The lower diagram shows the capacitor transformer included.

of pump efficiency and a wattage consumption test. The pump must be able to pump 150 lbs. pressure, and must be able to pull a 29-inch vacuum. Failing in this, the unit is rejected and returned to the rebuilding department.

While this work is going on, the compressor casing or dome base and the cabinet top have gone through a paint stripping process, which removes all old paint, dirt and grime, exposing the bare metal. The float housing has been cut open in a simlar manner to the compressor dome, and all parts carefully checked and replaced, where necessary. After assembly and welding of the float, it is tested under 100 lbs. pressure.

The control has been sent to the control department, where contacts have been replaced and all parts cleaned and inspected. After the control is again assembled, adjustments are made on the automatic control testing and calibrating machine. A higher degree of accuracy with less waste of time can be obtained with this machine than with the usual method of adjusting during operation on the completed unit.

The interior of the evaporator has been washed and cleaned with cleaning solution, which is forced through under 70 lbs. pressure, and then all excess cleaning fluid blown out.

All parts and assemblies are now ready for the complete unit assembly. The compressor dome is electric welded where the V cut was originally made. This welding job requires the best welding equipment obtainable, and considerable experience on the part of the operator. Welding sheet metal as thin as that contained in these domes requires exact voltage to prevent burning through, and at the same time, eliminating the small pin holes which will be the source of leaks. Also, the weld bead must not be too high so that it will interfere with the assembly of the dome to the cabinet top. The float valve and evaporator are then as-

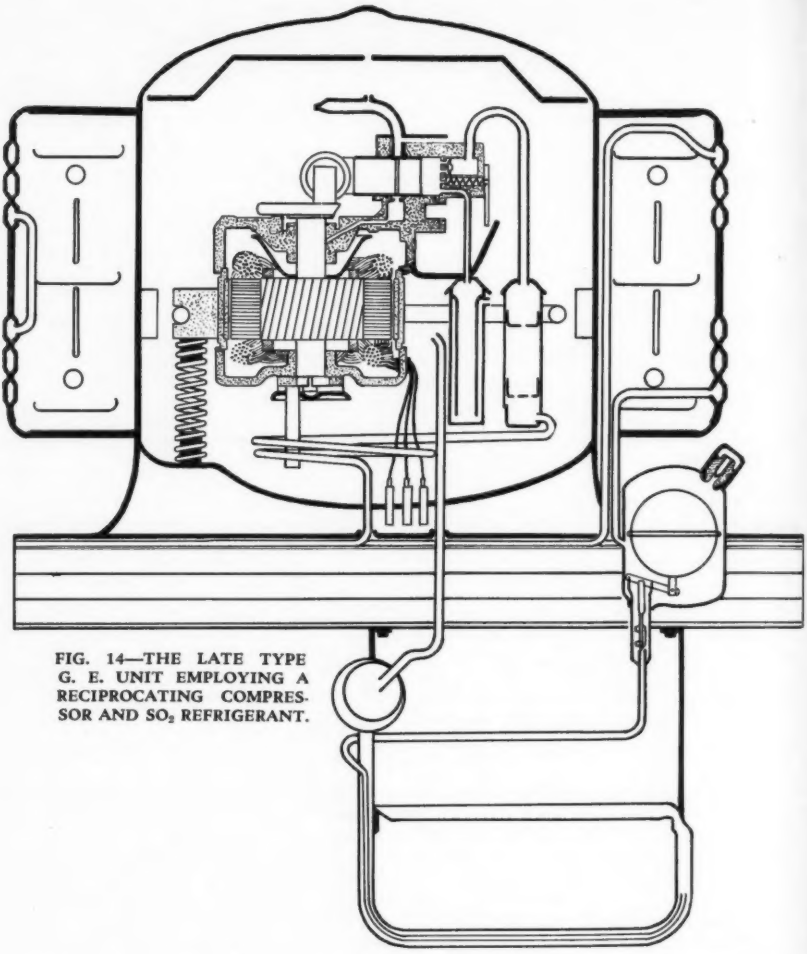

FIG. 14—THE LATE TYPE G. E. UNIT EMPLOYING A RECIPROCATING COMPRESSOR AND SO_2 REFRIGERANT.

sembled on the cabinet top, and the compressor dome replaced and spot welded where the original welds were made. Electrical connections are completed from the compressor dome to the control outlet, and tubing connections spliced and silver soldered.

After a pressure test for leaks is imposed on the assembly, it is sent to the dehydrating ovens for a thorough dehydration. Here again is a very important part of the entire job. Nothing can cause more trouble than an improperly dehydrated unit. To insure proper dehydration, it is necessary to hold the unit under at least 29 inches of vacuum and 200° F. over a period of at least 23 hours. After removal from the dehydrating ovens, the unit is permitted to cool to room temperature before doing anything further.

The electrical control may now be assembled to the unit, and electrical connections completed. The unit is charged with sulphur dioxide and oil, using Argon oil. Because the proper amount of oil required for these units has never been released by the General Electric Company, it is advisable to measure that taken from the unit when repairs are begun, and replace with a slightly

greater amount to compensate for the amounts that may be clinging to the various parts, or for any that may be lost in discharging the gas. The exact amount of gas can be determined as in any high side float system, by charging until frost appears on the suction line between the evaporator and top of box.

The units are next placed in a hot room where temperatures of 90 to 100 degrees F. are maintained. Under a 12-hour test period, the running time and wattage consumption are recorded on recording charts. Those units found satisfactory on this test are ready for the spray booth, where they are given a ground coat of aluminum paint, which is the best protection against rust, and finally, two coats of white Duco. The finished appearance of the unit must conform with that of the original when leaving the factory.

As a final check, all units are given a further 2-hour run before being placed in replacement stock, or being shipped. The keynote of success in the rebuilding of these units is entirely in the extreme care in all operations. The General Electric unit is a finely finished piece of machinery, depending on close tolerances and exact adjustments for its proper operation. With proper care in the work and adequate testing and calibrating equipment, no difficulties should be experienced in their rebuilding. They can not be successfully repaired, however, under the same conditions or with the same equipment as the conventional open-type unit.

Concluded

Moisture in Refrigerating Systems

By E. W. McGOVERN*

THE subject of moisture in refrigerating systems and the need for removing it is finally receiving the attention it deserves since manufacturers of refrigerating equipment and service engineers have learned that a large proportion of service difficulties is due to the presence of water. The well known acid reaction of moist sulfur dioxide and the quick flare-ups of trouble from wet sulfur dioxide systems forced recognition of the need for dry sulfur dioxide systems early in the development of the industry. However, the high resistance to reaction with water to form acids and the neutral nature of methyl chloride, methylene chloride and the "Freons" led to the early belief that with these refrigerants, moisture would not produce any ill effects beyond freeze-ups within the refrigerating system. Thus ice formation was often "cured" by means of anti-freezes, leaving the water to exert its other bad effects, causes of which were then vainly sought in other directions.

As we are primarily concerned with household, commercial and air conditioning refrigerating units, this discussion is limited to the refrigerants commonly used in such systems, namely, sulfur dioxide and the halogenated hydrocarbon refrigerants. The later include methyl chloride, methylene chloride, ethyl chloride and the "Freons."

Effects of Moisture

Corrosion with all of its various complications is the most common effect of moisture in systems containing any of these refrigerants. Oil deterioration is another trouble that may accompany moisture. Freeze-ups and copper "plating" may be encountered in wet halogenated hydrocarbon refrigerant systems.

Among the effects of corrosion are loose bearings, pitted needle valves, leaking seals, and even "frozen" pistons. The products of corrosion include metal salts and oxides which, being solids, can gum up valves and other moving parts and reduce the effectiveness of heat transfer surfaces. The non-condensible gas, hydrogen, formed by the action of acid on metal may in rare instances be troublesome.

That sulfur dioxide and water form sul-

* Chlorine Products Division, E. I. Du Pont de Nemours & Co. Paper delivered before the January meeting of the Illinois State Association, R.S.E.S.

furous acid, which is corrosive to all common engineering metals, has been well known. Not so well recognized until more recently was the fact that the halogenated hydrocarbons slowly hydrolyze, that is, react with water to form hydrochloric and/or hydrofluoric acid, and that over long periods of time and at high temperatures, which conditions are encountered in refrigerating machinery, they may form sufficient acid to present a serious corrosion problem. None of the common engineering metals will satisfactorily resist large amounts of hydrochloric acid.

Table 1 lists the results of tests showing the development of acid and corrosion of metals by methyl chloride in contact with relatively large amounts of water (0.1 per cent by weight or more). These data are indicative of the general behavior of all halogenated hydrocarbon refrigerants, although one may differ from another in degree of hydrolysis under a given set of conditions.

Methyl chloride should not be used with aluminum, zinc, magnesium and its alloys and die castings as these may be attacked even when only small amounts of water are present. Aluminum and methyl chloride, although non-reactive when perfectly dry, may, with only traces of water present, form spontaneously inflammable methyl aluminum compounds. Aluminum alloys containing magnesium should not be used with the "Freons" as corrosion may be encountered in the presence of small amounts of water.

Some oil sludging may be caused by or is at least enhanced by the acids formed by moisture. This sludge may act as a binder for solid metal corrosion products and may itself gum up parts of the system.

It is known that lubricating oils may dissolve copper from brass or copper parts of refrigerating systems and while the amount or rate of solution apparently is not affected by moisture and acid, these latter two, along with heat, are factors in throwing the copper out of solution and causing deposits of copper in refrigerating equipment. This is commonly called copper "plating."

The solubilities of water and ice in the halogenated hydrocarbon refrigerants are quite low, and therefore a larger amount of water usually gives warning of its presence by a freeze-up. The ice most commonly forms first at the expansion valve, but in very wet systems, tubing and coils carrying cold refrigerant may be blocked.

Solubilities of water in refrigerants are shown in Table II. A small amount of water in excess of that which will dissolve at a given temperature may not necessarily interrupt machine operation by a freeze-up as the amount of ice separated may be quite small and further the ice may not necessarily lodge at a place where it will cause blockage. For example, if we cool "Freon 12" containing 0.008 per cent water to 32 degrees F., 0.002 per cent water may separate as ice. In a system containing four pounds of refrigerant, this would amount to only 0.0013 ounces of ice, equivalent to less than a small drop of water.

Freeze-ups of sulfur dioxide systems are not ordinarily encountered because of the higher solubility of water in sulfur dioxide and the low freezing points of the solutions.

While laboratory tests and theory are

TABLE I—HYDROLYSIS AND CORROSIVE EFFECT OF WET METHYL CHLORIDE [7]

Time of Storage	Temp. °F.	Contents of Tubes	Corrosion Mg/Sq. in.	Acidity as % by wt. HCl
Start of Tests	77°	Methyl Chloride "dry"		< 0.0008%
4 days	122°	Methyl Chloride "dry"		< 0.0008
10 days	122°	Methyl Chloride plus 1% water....		0.0038
4 days	194°	Methyl Chloride plus 2% water....		0.276
30 days	122°	Methyl Chloride dry and iron strip		< 0.0008
20 days	122°	Methyl Chloride plus H_2O plus iron strip..	6.5	0.043
20 days	122°	Methyl Chloride plus H_2O plus copper strip	4.4	0.0008
30 days	122°	Methyl Chloride plus H_2O plus oil plus iron strip	29.1	0.170
34 days	122°	Methyl Chloride plus H_2O plus oil plus copper strip	9.7	0.365

[7] R & H Chemical Dept. E. I. du Pont de Nemours & Co., unpublished reports.

serviceable guides in predicting the behavior of moisture in refrigerating systems, we must draw our final conclusions from actual experience and tests with the machinery because of factors encountered in the machines which may not be exactly duplicated in laboratory testing. For example, in actual practice refrigerant velocities are high and this is very important in affecting corrosion. Also, temperatures at the discharge valve may be quite high and time of exposure is long. Experience has indicated that the average moisture content of SO2 and F-12 systems should be kept below 0.01 per cent. The limit for F-12 could be higher but for low ice solubility. The limit for methyl chloride is about 0.015 per cent, and that for methylene chloride about 0.02 per cent, but these should be lowered to the 0.01 per cent limit of high operating temperatures and type of oil introduce a copper "plating" problem.

assumed to be quite dry. The same is true with many supplies and accessories but care is required with some of these to insure dryness.

Lubricating oil for refrigerating systems is not sold on a maximum percentage by weight moisture specifications, but this point is covered by a dielectric strength specification which commonly does not exceed 30,000 volts minimum. Oil containing as much as about 0.01 per cent by weight water may pass this specification. A 25,000 volt oil may contain as much as .03 per cent water.[1] It is thus apparent that an appreciable amount of water may be introduced by oil fresh from the refinery. However, experience has shown that the amount of moisture in the better oils is of no consequence if it is not greatly added to by moisture from other sources. To keep oils dry, they should be kept in tightly closed containers and receive minimum exposure to the

TABLE II—SOLUBILITY OF WATER IN REFRIGERANTS

Temperature	Percent by Weight of Water in Refrigerant		
	Methyl Chloride (7)	Methylene Chloride (7)	Freon 12 (8)
—10.7°F.	.026	....	....
— 5.4	...	.0321	....
26.6	...	.0796	....
32.0	...	....	.006
33.8	.257	....	....
42.3	...	.115	....
60	...	....	.0114

Sources of Moisture

It is obvious that we can make a more intelligent approach to the moisture problem if we know the sources of moisture trouble. Possible sources of moisture in refrigerating systems include moisture on original parts and equipment which was not removed from the assembled equipment at the factory, wet oil, wet refrigerant, entrance of moist air during field assembly and servicing, water remaining after pressure testing and washing the equipment, faulty methods of charging oil and refrigerant, leaking water condensers and brine tanks and water cooled cylinder heads, leaking seals—moist air drawn into system, and perhaps slow oxidation of oil by air to form water.

Machine manufacturers are quite alive to the moisture problem, and equipment as received from the factory may generally be

[1] A. B. Matthis "Les Huiles pour Transformateurs et Interrupteurs", p. 32, Ramlot Freres et Soeur, Bruxelles.

atmosphere. A breather tube containing a drying agent such as Drierite, Activated Alumina, Silica Gel, or calcium oxide may be used to dry air drawn into the container as oil is withdrawn.

Refrigerant manufacturers in general sell methyl chloride on a specification of 0.008 per cent by weight maximum water; the specification for sulfur dioxide is generally 0.005 per cent maximum, that for "Freon-12" 0.0025 per cent maximum. These specifications and careful chemical control by the manufacturers insure products of satisfactorily low water content. However, a refrigerant may be contaminated when it is transferred to small service cylinders which have not been properly dried. Therefore, containers used in repackaging should be subjected to at least as much care to ensure dryness as is accorded the refrigerating machine—by flushing out with warm dry air, heating under vacuum, flushing with dry

refrigerant, or combinations of these treatments.

Extra precautions are required to prevent moisture trouble in commercial units such as walk-in coolers and display cases which have their assembly completed in the field, even though the low side and high side parts may both be dry when shipped from the factory. The same applies to equipment opened up for repair or service operations. We can ascribe the need for extra precaution in part to moisture picked up from the surrounding air by the open equipment. Since 86 degree F. air of 100 per cent relative humidity contains only about .03 ounce water per cubic foot, which is even less than that contained in a cubic foot of reasonably dry liquid refrigerant, it would appear that adsorption of water from air on the metal surfaces and condensation of water from the air on cooler metal surfaces are the important factors rather than the simple trapping of a small amount of moist air.

In manufacturing or servicing, equipment may be subjected to hydrostatic testing; or cleaned and degreased with aqueous solutions of an alkali or other detergent; or flushed with water to remove water soluble contaminants such as brine which may have leaked into the system, calcium chloride drying agent, or corrosion products. In this way relatively large quantities of water may remain in pockets if only a cursory drying method is employed.

Oil Contamination

While satisfactorily dry oil and refrigerant may be on hand, they may easily be contaminated with moisture equivalent to a few drops if great care is not taken in transferring them from container to refrigerating equipment. In these operations, water may come from the refrigerant charging connections and fittings, a dirty funnel, or prolonged exposure of oil to moist air. A substance like oil, which ordinarily will not absorb moisture from air, may do so when it is highly dehydrated and especially if it is poured in a long, slow, thin stream through humid air so that it gets maximum contact. In factory and wholesale servicing, it often pays to avoid contact of oil with air altogether by means of a charging board similar in principle to the type commonly used for refrigerants.

Large quantities of water may enter a system from a leaking condenser or water cooled head, or from brine or spray water being cooled by refrigeration. Sometimes one of these sources is overlooked when servicing a machine, and a difficult overhauling, drying, and recharging job must soon be followed by another.

When operating under a vacuum, air may be drawn into a low side through a leaking seal, or less commonly, through a leak in another part of the low side. This can more readily occur with low pressure refrigerants such as sulfur dioxide and methylene chloride, but obviously it can occur with others if evaporator temperatures are low enough. It would seem that the amount of moisture introduced by air would generally be of little or no consequence. However, small as the quantity is, it adds to whatever water may already be in the system. Furthermore, if a leak is not repaired and the system is continually purged with no provision made for moisture removal, considerable moisture may be introduced.

Another possible effect of air in refrigerating systems is that it may slowly oxidize oil, combining with the hydrogen in the latter to form water. A cubic foot of air at atmospheric pressure contains enough oxygen to form approximately 0.3 oz. of water. It is known that air will cause oils to oxidize and sludge, and although it is said that oxidation below 450 degrees F. does not form considerable amounts of water, it does not seem unreasonable to suppose that enough may be formed from air and oil under conditions of machine operation to be a factor.

Drying Methods

Methods of preventing moisture trouble, which consist of, first, doing everything possible to keep moisture out of the system and, second, removing the water if it does chance to be present, often go hand in hand. Means of keeping moisture out of systems are necessarily numerous and diverse, because of the many ways that moisture may enter a system; each source or condition must be considered separately. Likewise, methods of moisture removal that may be used justifiably are numerous because of differences in available facilities and equipment and differences in the moisture problems presented let alone differences in opinion as to how to attack a given problem.

Methods of moisture control that are used by builders of equipment include baking in vacuo; vacuum treatment at room temperatures, generally for large machines and sometimes combined with dry air flushing;

flushing with dry air or dry refrigerant; the use of temporary and permanent chemical dryers; and strict moisture "hygiene." By the latter is meant extreme vigilance to prevent entrance of moisture into equipment from all possible sources. Flushing with liquid refrigerant, especially in the case of sulfur dioxide machines, is sometimes used. A machine may be "run in" with refrigerant which is then discharged and replaced.

Baking in Vacuum

It is almost universal factory practice to dry small machines by evacuating them while they are heated in a hot room or oven. Vacuum and temperature are both high so that evaporation of water is sufficiently rapid and so that the remaining air and water vapor are highly attenuated and therefore negligible in quantity. The length of treatment must be sufficient to allow the equipment to be brought up to temperature, to allow pumping a high vacuum, to allow all liquid water to evaporate, and to insure removal of water held adsorbed on metal surfaces. Sulfur dioxide systems are commonly baked at 250 degrees to 275 degrees F. for at least four hours under a vacuum greater than 29.5 inches (less than ½ inch mercury or 0.25 pounds absolute pressure). The hot, highly attenuated water vapor left in the system by such a treatment would at most amount to only about 0.0095 ounces of water per cubic foot of internal machine volume or about one half drop of water in a machine of 0.1 cubic foot internal volume. In some very critical operations, or when vacuum or temperature are not sufficiently high, the first baking under vacuum may be followed by filling the machine with dry air or dry refrigerant and then repeating the hot vacuum treatment. This serves to flush out most of the small amount of residual moisture left after the first treatment. In thermostat manufacture where bulbs are filled with a gas such as methyl chloride, the vacuum-methyl chloride vapor flush cycle may be repeated three times to ensure removal of air and moisture.

Vacuum Treatment at Room Temperature

Vacuum baking of large machines in the factory or after assembling in the field or in servicing in the field is often not practicable. For such machines, high vacuum treatment of room temperature is commonly used. A common mistake is the failure to apply a high enough vacuum to cause the water to boil. For example, if only a moderately high vacuum is applied, say 28 inches, water in the system will not boil unless it is raised to a temperature of at least 104 degrees F., which is above room temperatures ordinarily encountered. At 59 degrees F., a vacuum of about 29.5 inches is required to produce boiling.

Another error sometimes encountered is the failure to apply the vacuum long enough to allow removal of adsorbed water and complete evaporation of all free liquid water. Heat must be supplied to boil water, and depending upon the rate at which heat is supplied by the metal parts of the refrigerating machine which pick it up from the surroundings, with sufficient vacuum pump capacity, the liquid water present cools down to a temperature where the rate of boiling is slow enough to be in line with the rate of heat supply.

This vacuum drying may be speeded by gentle application of heat at points where pockets of liquid water may be collected. Also, these very wet systems may be flushed with anhydrous methanol (methyl alcohol) before vacuum is applied. The residual methanol is more easily removed by vacuum treatment than is residual water since it is lower boiling, has a lower latent heat of evaporation, and has a lower specific heat. If the inside of a system is coated with oil or oil sludge, it is well to remove these by flushing with carbon tetrachloride or trichlorethylene before the methanol flush. Otherwise, oil and sludge which are insoluble in methanol may mask water from the solvent action of methanol.

Another refinement of vacuum treatment at room temperature is to fill with dry air or refrigerant vapor after evacuating and then reevacuate, as is sometimes done in vacuum baking.

Flushing with Dry Air

When vacuum is not available, moisture may be removed by flushing with dry air or refrigerant vapor. Air which is pumped into the refrigerating compressor may be conveniently dried with Drierite, Activated Alumina or Silica Gel. These may be reactivated after such use. Instead of pumping dry air through the machine it may be drawn through by means of a vacuum pump. A high vacuum pump is not required in this case and the water jet type may be used. Moisture evaporates rapidly into the dry air or refrigerant, especially since continual removal of water vapor by the moving gas

stream prevents saturation of the latter. Heat applied to the air or to the equipment speeds the process. As with vacuum treatment, a preliminary flushing with methanol speeds the drying when the system is quite wet.

After drying in the field by vacuum or flushing with dry gas, there may still be some doubt as to whether or not all water is removed. When the vacuum method is used on a tight system, it can be assumed that no large amount of water remains if a very low vacuum can be held when the pump is shut off. Testing the dry gas flushing method for the "end point" is more difficult, although the gas stream might be slowed down and tested for moisture as it leaves the equipment by a test paper impregnated with cobalt chloride which is blue in a humid atmosphere, red in a dry; or the effluent gas might be moisture tested with a humidity measuring device. However, the degree of water removal by vacuum or flushing treatments is often doubtful, and there is the possibility that moisture may again be introduced when refrigerant or oil is charged or after the machine is in operation. For this reason, installation of a temporary or permanent chemical dryer may often be advisable in the field, and sometimes in the factory, particularly with larger units.

To be Continued

In next month's issue the author will discuss Chemical Dryers, Individual Drying Agents, Antifreezes and Liquid Drying Agents.

What Superheat?

By GEO. H. CLARK

THE question of superheat settings to be used on various applications in connection with thermostatic expansion valves seems to be more or less controversial and misunderstood. In some cases real refrigeration experts have been somewhat hazy with respect to what goes on when condensing unit capacity is changed.

This article attempts to deal with some of the queries which the writer has heard expressed by a question and answer method. This material is presented in what it is hoped is an unbiased viewpoint for any particular design of valves or coils.

(1) Q. What is meant by superheat setting?

A. By superheat setting we ordinarily refer to the difference in temperature between the thermostatic bulb and the evaporation temperature that corresponds to the pressure at which the valve just closes.

(2) Q. How is a valve set for 10 degrees superheat?

A. By adjusting the valve to just close at a pressure corresponding to an evaporation temperature 10 degrees lower than the bulb temperature as the valve is being set. For example a Freon valve may be set to just close at 22½ lbs. gage outlet pressure with a 32 degrees bulb. 22½ lbs. gage corresponds to 22 degrees evaporating temperature. 32 degrees bulb — 22 degrees evaporation = 10 degrees superheat.

(3) Q. If a valve is set for 10 degrees superheat does it mean that it will regulate the refrigerant flow to maintain the refrigerant at the bulb 10 degrees warmer than that leaving the expansion valve?

A. No. The bulb in most cases will be somewhat warmer than the refrigerant in the suction line due to the fact that heat is picked up by the bulb from its surroundings and passed through the suction line to the refrigerant. This heat transfer will require a temperature difference. In some cases this may be as much as 5 degrees. In this case the refrigerant in the line would then be only 5 degrees warmer than saturated refrigerant or 5 degrees superheated.

On the other hand the pressure in the coil to give a full flow of refrigerant will have to be somewhat lower than the pressure at which the valve just closes. This tends to lower the evaporation temperature or increase the superheat.

(4) Q. What is meant by operating superheat?

A. The actual difference between saturation temperature and the bulb temperature.

(5) Q. Will the operating superheat for a valve set at 10 degrees superheat be higher or lower than 10 degrees?

A. Higher, due to superheat change required to give proper opening of valve.

(6) Q. How are thermostatic expansion valves rated as to capacity?

A. According to superheat change; that is, the valve is set for superheat at the point it just closes or has zero capacity. The outlet pressure is then dropped sufficiently to give a definite change in evaporating temperature such as three degrees or six degrees. The flow of refrigerant or actual capacity is then measured.

(7) Q. What affects the capacity of a valve?

A. Several items including the difference between inlet and outlet pressures, the sensitivity of the valve (the valve opening or movement, per pound of pressure change) the shape of the valve and the refrigerant used and of course the orifice size.

(8) Q. Explain why two valves of the same manufacture having the same orifice size but of different models have different capacities.

A. Probably the pressure responsive element (bellows or diaphragm) have different sensitivities, the valve of higher capacity having the greater sensitivity or greater needle movement per pound of outlet pressure change.

(9) Q. How does needle shape effect valve capacity?

A. The more blunt the needle, the greater the needle opening will be per thousandth of an inch needle movement.

(10) Q. What affects the sensitivity of a bellows?

A. Bellows effective area, thickness of the bellows material, the number of convolutions and the material characteristics.

(11) Q. What is meant by effective area?

A. The area affected by a change in pressure. If the pressure on a pressure responsive element is increased by one pound per square inch the increase in force in pounds, exerted by the pressure responsive element, is numerically equal to the effective area in square inches provided there has been no change in position or movement of the element.

(12) Q. How does the effective area of a diaphragm compare with the effective area of a bellows of the same diameter?

A. It will be less. Part of the force due to a pressure change on a diaphragm is taken up by the outside support of the diaphragm. In some cases the effective area or force at the center or supported movable part of the diaphragm may be only one third of the total diaphragm area.

(13) Q. What advantages, if any, has a bellows over a diaphragm?

A. Greater effective area per inch of diameter and greater allowable movement.

(14) Q. What advantages, if any, has a diaphragm over a bellows?

A. Cost and decreased volume in power element where a universal thermostatic fill is used.

(15) Q. What affects the superheat setting requirement for a given job?

A. The relative capacity of the evaporator to pick up heat from its surroundings and the capacity of the condensing unit to move heat.

(16) Q. Explain how a change in machine capacity with no change in evaporator can require a change in superheat setting to get maximum efficiency.

A. Suppose we have an evaporator which for purposes of illustration will be considered a continuous tube 100′ long, located in a brine bath.

Consider a 10-degree operating superheat and in the first instance a machine of one ton capacity or 12,000 B.t.u. per hr. In this use, the heat transfer would be 120 B.t.u. per hr. per foot of tube, if all the tube is being used. Suppose in this instance the refrigerant evaporates at a temperature 15 degrees lower than brine temperature. In this case evaporation may take place in all but the last few feet of tube and the brine being 15 degrees above evaporation temperature will warm the gas up 10 degrees in relatively a short section of tube so that if the bulb was insulated from the surroundings it would control at a gas temperature 10 degrees above evaporation temperature.

Now suppose the machine capacity was decreased to one-half ton. In this case with one-half the heat transfer, if as much of the tube was in use as previously, only one-half the temperature difference between brine and refrigerant would obtain. The refrigerant should therefore only be seven and

one-half degrees below brine temperature. In this case the refrigerant could not warm up 10 degrees above evaporating temperature as the brine is only seven and one-half degrees above evaporation temperature. Consequently the valve will have a tendency to starve the coil so that a refrigerant temperature at least 11 or 12 degrees lower than brine temperatures will obtain. Full operation of the coil could be obtained by changing the superheat setting to about six degrees in which case heat transfer can be completed in about the same amount of tube as in the first case with a seven and one-half degrees difference between brine and evaporation temperatures. The warm up to six degrees above evaporation can be effected by the seven and one-half degrees brine to evaporation temperature difference in a few feet of tube and maximum coil efficiency obtained.

As a third case, consider the capacity of the machine jumped to two tons. In this case with full coil operation to double the heat transfer, the temperature difference between brine and evaporation temperature should be doubled over the first case or should be about 30 degrees. If the brine were 20 degrees the evaporation temperature should then be —10 degrees.

However, the bulb will be affected by the brine temperature in its effect on refrigerant temperature. If the brine is 20 degrees the bulb would tend to stay at 20 degrees if only gas was coming through. In this case the valve would adjust itself to give 10 degrees evaporation. This would not be sufficiently low to allow all the heat transfer to take place in the coil with the result that some frost back is bound to occur. The cure is to adjust for greater superheat such as 25 degrees. In this case the refrigerant could evaporate at —10 degrees and then warm up to —5 degrees at the bulb and efficient coil operation would be obtained.

(17) Q. Summarize the effect of changing relative machine and coil capacities on proper superheat settings.

A. 1. Normal machine capacity for coil —superheat 10 degrees.

2. High machine capacity for coil —increase superheat above 10 degrees.

3. Low machine capacity for coil —decrease superheat below 10 degrees.

(18) What superheat would you recommend on a water bath coil where about 100 feet of 5/8 tube is used with a one-half hp. machine?

A. Probably two to five degrees superheat.

(19) Q. What superheat should be used on a forced draft coil as normally used?

A. About five degrees superheat.

(20) Q. What setting should be used on normal convection coil jobs?

A. About 10 degrees superheat.

(21) Q. Are there any cases where more than 10 degrees superheat is required?

A. Yes. On flat coils where refrigerant is not required to spill over from one tube to another and in cases where starved coils are required in order to balance loads and in cases of high condensing unit capacities for the coil load such as two hp. condensing units on small hardening cabinets, etc.

(22) Q. What is meant by surging?

A. Surging refers to an evaporator condition in which the evaporator is alternately fed too fast and then the valve closes tight or nearly tight until the next surge.

(23) Q. What is the effect of surging?

A. To decrease efficiency, cause intermittent flood backs, and in air conditioning to cause a wide variation in temperature leaving the conditioner coil.

(24) Q. What conditions aggravate surging?

A. Large coil tube diameters, superheat settings too high, valve capacity high for job in combination with one or more other difficulties, poor arrangement of refrigerant circuit through coils, top feed coils, etc.

(25) Q. What can be done to minimize surging?

A. Decrease superheat settings, use bottom feed if feasible; otherwise, use valve having orifice just sufficient to handle load, etc. Other methods of improving operation may be effective in some cases and detrimental in others. This problem is under constant study and new types of valves and coils may help eliminate or minimize surging.

(26) Q. What is an external equalizer in a thermostatic expansion valve?

A. A connection into the valve so that the pressure responsive element feeling the evaporation pressure responds to the pressure at the outlet of a coil or to the pressure at whatever point the connection is made rather than to the pressure at the outlet of the valve.

(27) Q. What purpose does the external equalizer serve?

A. It serves the purpose of compensating for a drop in pressure through a coil so as to operate from superheat at the coil outlet rather than from superheat depending upon thermostatic bulb temperature at the coil outlet and from evaporation temperature at coil inlet.

(28) Q. In what cases should it be used?

A. In cases where drop in pressure through a coil is excessive (possibly four pounds per square inch or over).

(29) Q. What is meant by constant superheat?

A. A constant superheat valve is one which maintains the same superheat setting throughout the whole range in operating temperatures.

(30) Q. Does expansion valve design have an effect on how constant the superheat is throughout the whole range of operation?

A. Yes. In general there are two different principles used to produce the constant superheat valve. One of these is the cross-charging principle in which constant superheat is obtained in valves having the same effective area in the power element bellows or diaphragm as in the body bellows or diaphragm or in single diaphragm valves. When the superheat is decided upon such as 10 degrees a charging fluid is selected which will have the same vapor pressure change, say from 30 degrees to 40 degrees, as the refrigerant to be used in the system has, from 20 degrees to 30 degrees. This same fluid should also have the same vapor pressure change from zero degrees to 10 degrees as the refrigerant in the system has from —10 to zero degrees. Thus for a 10 degrees superheat Freon valve, methyl chloride makes an excellent charge. For the other refrigerants to obtain equal results a mixture of gases might be required.

Another principle used is that of proportioning the effective areas of power element and body bellows or diaphragms so as to use the same refrigerant as a thermostatic charge as is used in the system. In this case the pressure change of the refrigerant from 30 degrees to 40 degrees times the effective area of the power element bellows or diaphragm should equal the pressure change of the refrigerant from 20 degrees to 30 degrees times the larger bellows or diaphragm responsive to valve outlet pressure.

(31) Q. Does a valve which holds a constant 10 degrees superheat hold a constant five degrees or 15 degrees superheat?

A. No. A 10 degrees superheat valve set for five degrees superheat at low temperature will tend to increase the superheat at higher temperatures while when set for 15 degrees at low temperatures the superheat will decrease at higher temperatures.

(32) Q. Will a constant superheat valve give ideal operation under all conditions?

A. No. Theoretically the superheat should be increased at high suction pressures due to the fact that a condensing unit has a higher capacity to remove heat at high suction pressures. For any one job a valve which would decrease superheat slightly as the suction pressure decreased would be ideal for a particular job. A constant superheat valve however will give in general best all around results when applied to all types of jobs.

(33) Q. Does the effective area of a bellows or diaphragm vary?

A. Yes. The effective area of a bellows changes very slightly at extremely high pressures. The effective area of a diaphragm changes with its working position and with pressure changes.

(34) Q. Can a thermostatic expansion valve be properly set for superheat in the field?

A. Yes. By the usual method using crushed ice to maintain a 32 degrees bulb temperature and adjusting the valve to give the outlet pressure corresponding to 22 degrees (if the valve is to be set for 10 degrees superheat) with a small leak between the valve outlet and a gage. If five degrees superheat is desired set outlet pressure to correspond to 27 degrees. If three degrees is desired set for 29 degrees, etc.

(35) Q. Can a thermostatic expansion valve be set on a job properly?

A. Yes. In fact a better job can be done this way than in any other for a particular job. To make the ideal setting for the job adjust the valve for less than normal superheat or until a steady flood-back in the suction line occurs. Then adjust for increased superheat a very little at a time until the flood-back comes just as far through the coil and suction line as desired. Too much superheat will cause a wide variation in the extent of flood-back.

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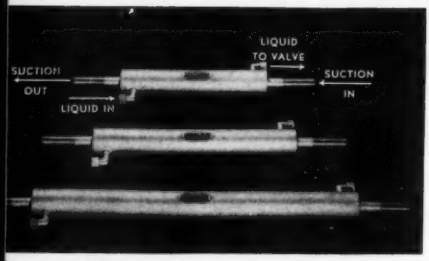

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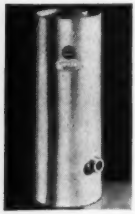

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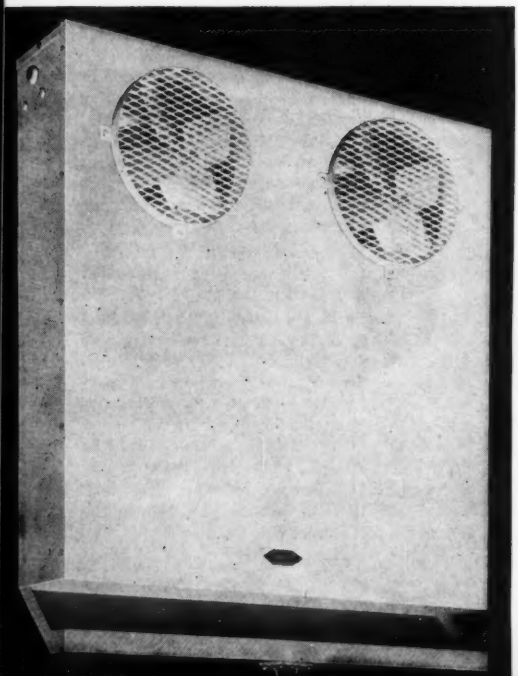

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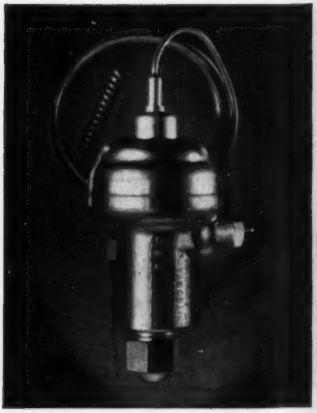

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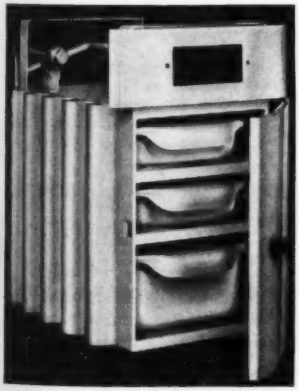

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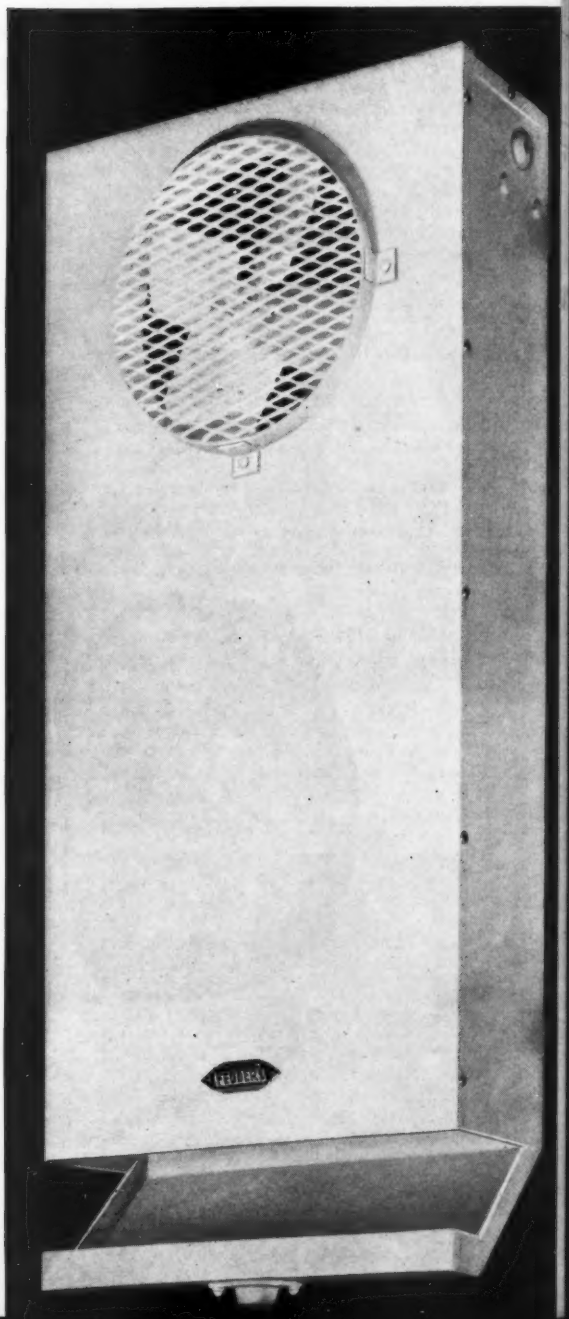


(36) Q. What precautions are to be observed in setting valves on the job?

A. There are two important precautions. One is to set the valve when normal working conditions obtain. In other words make a final adjustment where necessary after the evaporator has been brought down to operating temperatures. Do not adjust a factory set valve until it has had a chance to operate for some period of time except in extreme cases. Another precaution is to be sure the valve is not adjusted for a zero or negative superheat to give proper coil operation due to an excessive pressure drop through the coil. Such an adjustment would allow the coil to flood badly during an off period.

(37) Q. What is meant by negative superheat?

A. Negative superheat simply refers to a valve adjustment where the evaporation temperature leaving the valve is higher than the controlling bulb temperature.

(38) Q. In what cases can a negative superheat adjustment be used satisfactorily?

A. Where an excessive pressure drop occurs between the coil inlet and outlet either due to friction or some auxiliary valve. Where the pressure drop is due to friction the liquid line should be shut off and the coil pumped down each shut-down period to prevent flooding the compressor in starting. This is done usually by a solenoid valve in the liquid line. Where the pressure drop is due to some auxiliary valve, the valve used may determine whether it is necessary to use a solenoid valve also.

? ? ?

to freeze the malted milk fast enough.

This brine tank is equipped with 40 gallons of alcohol, 18 gallons of water, and has 120 ft. of one-half inch coil. Do you think that by increasing the horsepower and compressor that we could use the same tank, or if not, what would you suggest? This machine is an air-cooled job. Would you suggest a water-cooled compressor?

ANSWER: From the description you give of the operation of your Schaefer malted milk machine, I am of the opinion that the hold-over capacity of the unit is not great enough.

You have not supplied me with any B.t.u. load figures, and I am, therefore, not able to check against the capacity of the machine. However, I would think that a ¾-hp. unit should handle a tank of 58-gallon capacity very easily.

If, in order to overcome your present trouble, you increase the size of the unit, the operating periods of the machine during the light load times would be very short, creating a rather undesirable condition during the greater part of the day. If the machine now pulls the brine down to its proper temperature within 3 to 5 minutes in the mornings, and you were to increase the horsepower of the machine, it would decrease this operating time. If, however, the size of the brine tank was increased, so that your storage capacity is greater, the machine would operate over a longer period during your slack business hours, and would store up sufficient temperature to carry over a longer rush period.

I believe this tank and the evaporator coil could be increased from one-half to double its present size.

ADJUSTING AN AIR CONDITIONING JOB

QUESTION 298. What is the correct way of adjusting the expansion valves on an air conditioning coil of the following description? The coil is fed by four thermostatic valves; Freon is the refrigerant; the compressor is a 10-hp. and has a sight glass in the suction manifold. What is the appearance of the gas mixture at the sight glass when the valves are feeding the correct amount of refrigerant?

The complete set-up employs two compressors of the above size, and also, another coil fed by four expansion valves. These coils are both mounted in a single housing through which the air is circulated by a fan, and distributed to a single room.

At what pressures should the controls be set to cut-in and cut-out? Also, what should the head pressure be, using 58-degree water?

ANSWER: We took the liberty of referring this to Mr. Joe Askin, chief engineer of the Fedders Manufacturing Company, and his reply follows:

Mr. Askin's Solution

"The thermostatic expansion valves should be opened until the suction line sweats slightly. Most air conditioning systems operate at a suction temperature of 40°F., leaving the expansion valve and with approximately 10° superheat through the coil. This would mean that the temperature in the suction manifold should be 50°F. When adjusting the expansion valves, some servicemen determine the proper opening of the expansion valves by watching the appearance of the suction line and feeling with their hands to determine the temperature. Others clamp an indicating thermometer to the suction line. Another method would be to take a piece of molding clay and keep a mercury thermometer in place against the suction line by plastering the molding clay around the thermometer when held against the suction line.

"There is no way in which you can tell whether the expansion valves are opened sufficiently by means of a sight glass in the suction manifold. Refrigerant vapor, whether saturated or dry, is not visible. All that would be seen through the sight glass is globules of oil or oil foam. Should the valves be open too much, then there would be an excessive amount of liquid passing by the sight glass, which may help to determine whether or not there is liquid refrigerant mixed with the oil. This, however, is very hard to determine as the oil and refrigerant mix thoroughly.

"Most air conditioning installations are controlled by means of thermostatic controls. In general, the servicemen need not use the suction pressure control. In some cases, however, the serviceman will set the suction pressure control so that it will stop the machine when the pressure for some undetermined reason goes into the vacuum range. This is likely to result in excessive oil pumping, and to avoid this the serviceman will set the machine to cut-out at 0°F.

"Should the service engineer wish to operate the air conditioning machine with a pressure control, the result may not be very satisfactory. However, if he insisted upon operating with a pressure control, the set-

tings which we suggest are as follows:

"With Freon refrigerant, cut-out pressure 32 pounds; cut-in pressure 52 pounds.

"With methyl chloride refrigerant, cut-out pressure 23 pounds; cut-in pressure 40 pounds.

"The high pressure cut-out is usually set by the manufacturer at the factory, and is approximately 200 pounds.

"The water valve should be set so that the head pressure, when Freon refrigerant is used, would be approximately 130 pounds, and when methyl chloride is used, approximately 115 pounds. Of course, a lower head pressure can be arranged in view of the fact that the water temperature is exceptionally low, namely 58°F. But if this is done, then when the water temperature rises, there may be an excessive consumption of water."

S S S

WINNERS OF THE "SERVICE KINK AND TOOL CONTEST"

BEGINNING on November 1, and ending at midnight on December 31, 1938, THE REFRIGERATION SERVICE ENGINEER conducted a prize contest on the most useful, the most original, and the best illustrated or described "Service Kink or Tool."

The response to this contest and the number of fine contributions to it were far beyond expectations. It is expected in the coming months, during which most of these entries will be published, that readers of this journal will derive considerable benefit from the suggestions made.

The large response to the contest and the additional work of judging delayed the final decision. All contestants were notified, however, on February 17, of the decision of the judges.

The first prize of $25.00 was awarded to Mr. R. E. Meeker, 17 East 39th St., Kansas City, Mo., and the second prize of $10.00 to Mr. J. P. Iseman, Jr., Hugo, Colorado. The three next best entries received $5.00 each, and they were as follows:

Mr. Donald Hunt, Watervliet, Michigan.

Mr. Frank Depagnier, 822 Melrose Ave., New York, N. Y.

Mr. Elmer Hunyady, 1148 Dohrman St., McKees Rocks, Pa.

Judges of the contest, as stated in the rules, were: Mr. George H. Clark, Detroit, Mich.; Mr. Paul Jacobsen, Marion, Ind.; and Mr. Harry D. Busby, Chicago, Ill.

REVERSE CYCLE AIR CONDITIONING SYSTEM

BY extracting heat from ordinary outside air, the reverse cycle air conditioning unit, latest engineering achievement in the field, eliminates all fuel costs in heating and air conditioning the new office building of the Westinghouse Electric and Manufacturing Company at Emeryville, California. Operated automatically, the system maintains a selected temperature and humidity without any variation the year around, according to Frank Jordan, Westinghouse air conditioning engineer, who designed the installation.

First to be placed in commercial use in the San Francisco Bay area, this reverse cycle unit operates on the principle that outdoor air throughout the world contains heat in two forms: sensible and latent. It is theoretically possible to extract heat from the air under all natural conditions, down to a temperature of —459.6 degrees F.

This heat is removed from the air by the action of mechanical refrigeration, and sent through the ducts to heat and properly humidify the entire building. In summer, the cycle is reversed and the excess heat removed from inside the building.

Efficiency Depends on Insulation

"As might be expected, the successful operation of this air conditioning system depends on the efficiency of the insulation," stated Jordan. "The insulation is necessary literally to seal out interference from the outside." For this reason, the building is installed throughout with double glass windows. Six-inch steel-reinforced concrete walls were specified. The loose insulating material used for filling in the 4-inch spaces between the inner and outer walls, and between the ceiling joists was Palco Wool, made from shredded redwood bark. This material is in high favor in the air conditioning field because of its high thermal efficiency and resistance to moisture. The thermal conductivity is .255 B.t.u. according to Peebles of Armour Institute of Technology and it is said to have practically no capillarity. Light and fleecy, its wiry fibres give it unusual resilience, tests showing that it can resist the most severe condition of vibration with no settlement whatsoever.

The two story office building, used for district accounting, sales clerical and stock control departments, was designed and engineered by Frederick Jenks, of Westinghouse. Contractor was P. J. Walker & Company, San Francisco.

REFRIGERATION SERVICE ENGINEERS' SOCIETY

Official Announcements of the activities of the National Society and Local Chapters appear in this department as well as articles pertaining to the educational work of the Society.

A REQUEST FROM OUR EDUCATIONAL DIRECTOR

Fellow Members of the R. S. E. S.

Up to the present, your educational bulletins have been of a general technical nature and have not treated in detail specific refrigeration applications.

I believe a number of the members may have had experience in some particular phase of refrigeration and I am soliciting help from you.

Write me at 6060 Rivard St., Detroit, Michigan, and tell me what topic you can write up for a bulletin. I will then suggest how this may be handled. A number of topics on which material is desired are as follows:

Meat Cooling:
Counter Refrigeration
Walk-in Coolers
1—Use of Convection Coils
2—Use of Forced Convection Coils
3—Humidity Control In
Locker Storage
Multiple Temperature Control

Beverage Cooling:
Dry Type Bottle Cooler
Wet Type Bottle Cooler
Ice Bath Water or Beer Cooler
Direct Expansion Beverage Coolers
Brine Circulating Coolers

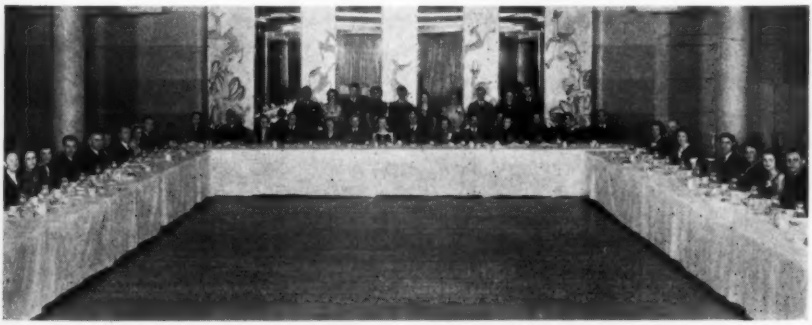
Milk Cooling:
Brine Systems
Wet Bath Coolers
Dry Storage Coolers

Ice Cream:
Ice Cream Cabinets—Brine Tank
Ice Cream Cabinets—Dry Type
Ice Cream Cabinets—Congealing Tanks
Ice Cream Hardening Cabinets
Ice Cream Freezers

Bakery Refrigeration
Display Case Refrigeration
Florist Installations

Please help your Educational Committee. You will receive credit in the bulletins for your contributions. "Thar's gold in them thar hills." Let's dig it out.

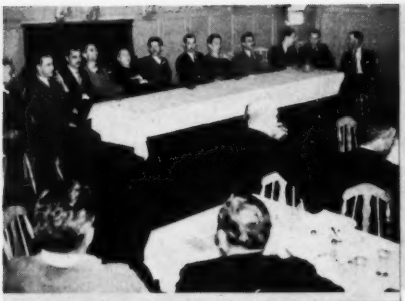
GEORGE H. CLARK,
Chairman, National Educational and Examining Board, R. S. E. S.

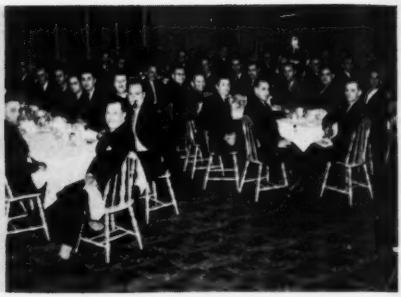


KANSAS CITY CHAPTER ANNUAL BANQUET

The Kansas City Chapter annual banquet, held January 25 in the Bellerive Hotel, from all reports was a huge success. The party was confined to members and their wives or lady friends only, and in connection with it this year, the installation of the new 1939 officers took place.

A feature of the evening was a guessing contest on a jar of flare nuts. A prize for the winning lady and one for the winning man was donated by the Forslund Pump & Machinery Co.





VIEWS OF THE VOX POP CONTEST MEETING

Upper Left—The contestants seated around the table, ready for the quiz. Upper Right—Group photo of meeting. Lower—The winners, left to right are: C. O. McClellan, Third Prize Winner, No. 517A Hinsdale Tool Chest; S. H. Payne, Second Prize Winner, No. 18J Hinsdale Set of Tools; F. H. Doore, First Prize Winner, No. 412 Hinsdale Chest of Tools. Prizes were donated by Refrigeration Service, Inc., Los Angeles, Calif. All photographs were taken by L. P. Roth, of Refrigeration Service, Inc.

VOX POP CONTEST MAKES INTERESTING MEETING FOR LOS ANGELES CHAPTER

AN interesting chapter meeting that provided considerable interest was sponsored by Los Angeles Chapter on February 22nd.

Twelve contestants were selected from the chapter membership to participate. Eight groups of questions were used with twelve questions to a group. Each contestant was asked one question in each group of questions and ten points were awarded for the correct answer. If the question was answered partially correct, the umpire, whose decisions were final, determined the number of points the contestant should receive. Each contestant was allowed a time limit of thirty seconds for his answer.

The officials of the contest consisted of a reader of questions, a timekeeper and an umpire.

To make the contest interesting to non-participants, each member was furnished with a pad and requested to make notes on any of the questions or answers, so that after the contest they could comment on the answers. Many of the notes made will be used for discussion at a future meeting.

Prizes were donated by Refrigeration Service, Inc., 3109 Beverly Blvd., Los Angeles, consisting of a first prize of a No. 412 Hinsdale chest of tools; second prize, No. 18J Hinsdale set of tools, and third prize, a No. 517A tool chest.

Mr. F. H. Doore was awarded first prize with a score of 70 out of a possible 80. Second prize was awarded to S. H. Payne. Third prize winner was Mr. C. O. McClellan.

A recess was called at the half-way point and it was interesting to observe that the prize winners forged ahead during the second period of the contest.

Questions were asked by Frank Gillett, with A. C. Line acting as timekeeper. J. C. Blair served as umpire.

* * *

MISSISSIPPI VALLEY CHAPTER THIRD ANNUAL BANQUET

THE Blackhawk Hotel in Davenport, Iowa was the scene, and February 18th the date of the Mississippi Valley Chapter's third annual banquet and entertainment.

About 150 people were present for this very enjoyable evening, including many visitors from other cities. Among those visitors

Longer DIAPHRAGM Life!

★ SMALL MOVEMENT OF DIAPHRAGM

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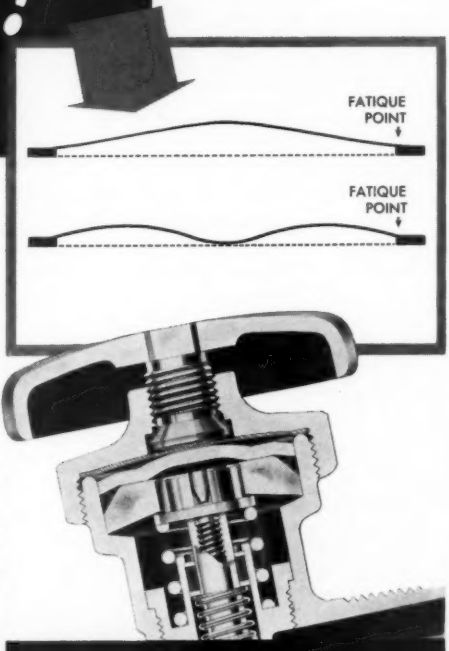
★ MUCH LESS METAL FATIQUE

★ NEVER DEFLECTED BEYOND NORMAL CENTER



● In the new Tripl-Sealed Line Valve the life of the diaphragms is greatly prolonged, thus immeasurably adding to the life of the valve itself in service.

In conventional diahpragm operation the diaphragm operates through and beyond its center point, producing what is generally known as "oil can" action. This continual snapping when opening and closing the valve fatigues the metal at the edges where it is secured to the body, and in a comparatively short time results in service failure of the valve. The diaphragm of the new valve has approximately 20% increased surface area over other types of diaphragms in similar sized valves, but most important of all IT IS NEVER DEFLECTED PAST ITS NORMAL CENTER WHEN OPENING OR CLOSING THE VALVE.

A single turn only is all that is necessary to open or close.

Send for illustrated literature. Order through your jobber

MUELLER BRASS CO.

PORT HURON, MICH.

were: Herbert Hale, of the Central Indiana Chapter, who came all the way from Kokomo, Indiana; Willis Stafford of Aurora, Ill.; Herman Goldberg of Chicago; Mr. and Mrs. C. E. Johnson, Mr. and Mrs. M. W. Knight and Mr. and Mrs. W. A. Honeychurch of Peerless of America, Inc., of Chicago; Floyd Duvall of the Mills Novelty Co. at Chicago; Joe Page of the Detroit Lubricator Co., J. M. Chambers of the Mueller Brass Co., and Bob Anderson of the Imperial Brass Mfg. Co.

Mrs. Harriet Berberet, secretary of the Ladies Auxiliary, deserved the praise of the chapter for the able manner in which she got up the program and arranged for the entertainment. The floor show was enjoyed by all. It consisted of five acts of diversified entertainment which included, humor, singing, dancing, trick roller skating, accordion playing and other acts of interest. The entertainment was preceded by an enjoyable steak dinner and followed by dancing to the music of Esten Spurrie's Ramblers.

S S S

SPRINGFIELD CHAPTER DINNER PARTY

THE Springfield Chapter held a dinner party January 28th which was planned by Mr. Kenneth Beatty, Mr. F. W. Nichols, and Mr. E. D. Kresse. Mr. Kenneth Beatty, who was chairman of the committee on arrangements, acted as toastmaster. President R. M. Potter gave a short address in which he thanked the committee in charge for their splendid work in arranging the party.

After the dinner the evening was spent playing games which included pinochle, bridge, and Chinese checkers. The winners are as follows: For bridge Mrs. F. W. Nichols and Mr. A. L. Fait. For pinochle Mrs. E. D. Kresse and Mr. John Stoppelwerth. For Chinese checkers, A. L. Hammond first, and Mrs. Wm. Benner second.

The winners for the door prizes were as follows:

First—Mrs. Kenneth Beatty.
Second—Mrs. E. D. Kresse.
Third—Mr. John Bokora.
Fourth—Mr. John Stoppelwerth.
Fifth—Mrs. F. W. Nichols.
Sixth—Mrs. A. L. Hammond.

The evening was enjoyed by all who attended and a lot of credit is due the committee on arrangements for the splendid program and particularly for the fine dinner.

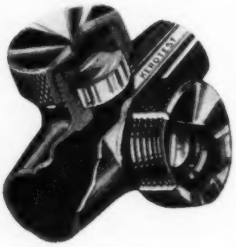
In Popular Demand!

KEROTEST

BULLS-EYE

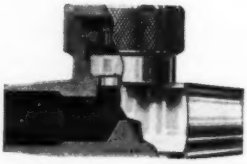
LIQUID INDICATORS

WITH KNURLED SEAL CAPS



KEROTEST LIQUID INDICATORS are designed in both single and double bulls-eyes and are equipped with a knurled seal cap fitted with a relatively soft gasket to facilitate pulling up finger tight. This protects the glass bulls-eyes and also provides a secondary seal against leakage, an important feature where large liquid lines and consequently large quantities of expensive refrigerants are employed.

Excellent visibility of the refrigerant is provided in the Kerotest Types 652-S and 653-S Liquid Indicators designed with two bulls-eyes inclined at a 90 degree angle. A flashlight directed into one port reveals a complete cross section of the refrigerant in the other port.



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Baltimore, Md..Melchior, Armstrong, Dessau Co.
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Boston, Mass. ..... A. E. Borden Co.
Bridgeport, Conn. ..... Parsons Bros.
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Chicago, Ill. ..... H. Channon Co.
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.....Automatic Heating & Cooling Supply Co.
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Cleveland, Ohio..... Williams & Co., Inc.
Dallas, Texas ..... The Electromotive Co.
Davenport, Iowa ..... Republic Electric Co.
Dayton, Ohio..... The W. H. Kiefaber Co.
Denver, Colo. ..... Auto Equipment Co.
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Fort. Wayne, Ind. ..... H. J. Schroeder Co.
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Jacksonville, Fla. ..... Jamita Company
Kansas City, Mo. .....
.....Forslund Pump & Machinery Co.
Knoxville, Tenn. .....Leinart Engineering Co.
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Long Beach, Calif. ..... L. B. Marsh
Los Angeles, Calif. ..... Frank Gillett Co.
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Louisville, Ky...Louisville Mill Supply Co., Inc.
Lubbock, Tex. R. & R. Parts & Supply Co., Inc.
Macon, Ga. ..... Lowe Electric Co.
Madison, Wis. .....Gustave A. Larson Co.
Memphis, Tenn...United Refrigerator Supply Co.
Miami, Fla. ..... Bailey-Milam, Inc.
Milwaukee, Wis. .....Refrigeration Specialty Co.
Minneapolis, Minn. .....
...Refrigeration & Industrial Supply Co., Inc.
Minneapolis, Minn. .....
.....Vincent Brass & Copper Co., Inc.
Montreal, Quebec, Canada. .....
.....Railway & Engineering Specialties, Ltd.
Mt. Vernon, N. Y. .....
.....County Seat Plumbing Supply Co
Newark, N. J. ..... T. W. Binder Co.
New Haven, Conn. ..... Resco, Inc.
New Orleans, La. ..... Enochs Sales Co.
New York, N. Y. ..... Aetna Supply Co.
New York, N. Y. .....
.....Melchior, Armstrong, Dessau Co., Inc.
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New York, N. Y. .....The Harry Alter Co., Inc.
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Oklahoma City, Okla. .....Mideke Supply Co.
Omaha, Nebraska ..... United Supply Co.
Oshkosh, Wis. ..... Gustave A. Larson Co.
Paterson, N. J. ..... White & Shauger, Inc.
Peoria, Ill. ..... Wilkins Pipe & Supply Co.
Pittsburgh, Pa. ..... Williams & Co., Inc.
Philadelphia, Pa. .....
.....Melchior, Armstrong, Dessau Co., Inc.
Philadelphia, Pa. .....Victor Sales Corporation
Phoenix, Ariz. Refrigeration Supplies Distributor
Portland, Ore. .....
.....Bill Heiber, Refrigerative Supply, Inc.
Providence, R. I. .....
.....Rhode Island Supply & Eng. Co.
Rochester, N. Y. .....Ontario Metal Supply, Inc.
Rochester, N. Y. .....
.....Melchior, Armstrong, Dessau Co., Inc.
Rockford, Ill. ..... Gustave A. Larson Co.
Sacramento, Calif. ..... Hinshaw Supply Co.
St. Joseph, Mo. ..... Bristol Supply Co.
St. Louis, Mo. .....The Harry Alter Co., Inc.
St. Louis, Mo. .....R. E. Thompson Company
Salem, Mass. ..... Standard Supply Co.
Salt Lake City, Utah..... Peerless Utah Co.
San Antonio, Texas ..... Straus-Frank Co.
San Francisco, Calif..California Refrigerator Co.
Seattle, Wash. ..... Refrigerative Supply, Inc.
Sioux City, Iowa..National Refrigeration Service
South Bend, Ind. .....F. H. Langsenkamp Co.
Springfield, Ill. .....United States Electric Co.
Springfield, Mass. ..... C. P. Payson Co.
Toledo, Ohio. The Heat & Power Engineering Co.
Toronto, Ontario, Canada. .....
.....Railway & Engineering Specialties, Ltd.
Tulsa, Okla. .....Machine Tool & Supply Co.
Vancouver, B. C., Canada.....Fleck Bros., Ltd.
Washington, D. C. .....Refrigeration Supply Co.
Waterloo, Iowa .....Winterbottom Supply Co.
White Plains, N. Y. .....
.....County Seat Plumbing Supply Co., Inc.
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Chapter Notes

MISSOURI VALLEY CHAPTER

January 5—Immediately after the meeting was opened it was turned over to the Educational Chairman, Mr. Austin Jones. The first subject for discussion was the forthcoming examination for certificate membership. Members were asked to sign up for this examination, and the Secretary was instructed to write to the National Secretary's office for the examination papers.

Mr. Furber of the Minneapolis-Honeywell Regulator Co. was then introduced and he spoke on the subject of controls. Accompanying his talk with illustrated slides, Mr. Furber's talk was found to be very interesting and educational. His talk covered three sections, the first of which was suction pressure control, followed by a discussion on temperature controls, and finally the Polartron system.

On completion of Mr. Furber's talk, the meeting was turned back to President F. C. Haeberlein, and the business of the evening got under way. One of the interesting discussions during the business meeting was that of the pending refrigeration code, during which Mr. Ferguson gave a resumé of the code as used in Kansas City, and Mr. Joe Dempsey described the code as used in Chicago.

February 2 — After the meeting was opened, Mr. Austin Jones, chairman of the Educational Committee, introduced Mr. Page of the Detroit Lubricator Co., who gave a brief resumé of all of the phases of the All-Industry Refrigeration and Air Conditioning Exposition in Chicago.

Mrs. P. O. Jones supplemented this talk with her impressions of the exhibition.

Mr. Jones showed a number of pictures taken at the exhibition, which gave an interesting description of the various exhibits.

The speaker of the evening—Mr. Dave Sutton, factory representative of the Dayton Rubber Mfg. Company—was then introduced and gave a very interesting talk accompanied by a sound film. The film portrayed the many advantages of V-belt drives, as well as a description of the construction of Dayton cog-belts and the various points of superiority claimed by the manufacturer.

The meeting was then turned back to President Haeberlein, who asked for a report on the progress of the refrigeration code. Mr. Doyle, chairman of the Public Relations Committee, gave this report, giving a complete resumé of the progress made to date.

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● *ANSUL ICE-X dissolves ice and prevents ice formation. Non-corrosive, it contains no methyl or ethyl alcohol, no alkali, acid or other corrosives. It leaves no residue, does not react with refrigerants or oils. It may be used with acrolein methyl chloride.*

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A general discussion followed on the subject, and the President advised that Mr. R. Brown, City Engineer, had asked that the chapter provide a draft of the service clauses of the code which would be satisfactory to the Society. Mr. A. Jones and Mr. Ralph Walbridge were appointed to cooperate with Mr. Brown in this work.

CENTRAL NEW YORK CHAPTER

December 12—The greater part of the meeting was devoted to the election of officers, with the result that the following were elected: H. A. Persett, *president;* R. D. Hursh, *vice-president;* W. R. Andrews, *secretary;* P. D. Cross, *treasurer;* W. J. Menzies, *Sergeant-at-arms.*

January 9—Considerable discussion occurred on the forthcoming banquet which was planned for February 18th. Those selling tickets for the affair were urged to turn in their reports as soon as possible.

Vice-president R. D. Hursh introduced the speakers for the evening—Mr. P. Domke and Mr. Jones of the Mueller Brass Co. Valves, strainers, sweat fittings, etc., were very thoroughly discussed and demonstrated by these gentlemen.

One of the features of the evening was a door prize which consisted of a Kerotest hermetic kit. The prize was won by Bill Andrews.

January 23—The meeting was held at the Syracuse Supply Co., and the feature of the evening was a talk on the care and preservation of fresh and smoked meats, which was given by Mr. Cross of Swift & Co. His talk was of such general interest that the ladies were invited, and many of them were present.

A door prize offered for the evening was won by Mrs. G. Davenport.

February 13—The meeting was called to order by Mr. P. Cross in the absence of the President.

The speaker of the evening was then introduced—Mr. Marshall of the Automatic Products Co.—who gave an interesting discussion on the products manufactured by his company. Mr. Marshall really knows his products and his discussion was found very interesting.

A report on the ticket sales and the progress of the forthcoming banquet indicates very satisfactory results are being obtained.

February 18—The second annual banquet of the chapter was held at Bill Wagner's Cross Keys Inn, at Three Rivers, New York, with an attendance of forty-eight.

The different phases of refrigeration were well represented by men from leading refrigeration establishments well as the better independent service engineers and their wives and sweethearts. Mr. Ted Glou of the

Central Service Supply Co. of Scranton, Penna., was the toastmaster.

A sleight-of-hand, ventriloquist and mind reading act supplied the entertainment. There was also a five-piece girl band for dancing. Personal radio furnished by a refrigeration supply house as a door prize was won by Mr. Maybe. A very good time was had by everyone, thanks to the good work done by the banquet committee, supply houses and good fellowship of the members of the chapter.

TOLEDO CHAPTER

February 8—During the course of the business session of the evening, Mr. Ray Dunlap reported that an air conditioning engineer had offered his services in forming a city code. Further reports on the progress of the code showed favorable results.

Announcement was made that in the March meeting a thorough discussion of electric motors would be given and that future meetings thereafter would be featured by such subjects as heat transfer, water and beverage cooling, controls and installations.

The educational feature of this meeting was an interesting talk and demonstration given by Mr. Hood of the Ansul Chemical Co. on Ice-X.

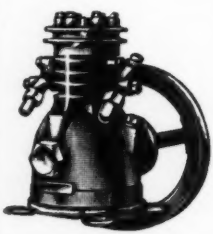
TRI-STATE CHAPTER

February 20—This meeting was held in the home of President A. W. Gruber in Ironton, Ohio, where a very enjoyable dinner served by the ladies of the auxiliary was the first event of the evening. After everyone—even Mr. A. W. (Dutch) Gruber—could eat no more, the business session was called to order.

The business session of the evening consisted of the usual reports, reading of minutes, passing of bills, etc., after which a general discussion regarding desirable educational features for forthcoming meetings occupied the major part of the evening. Very good suggestions for future material was derived from this discussion and it is hoped that an educational program can be built around these suggestions.

SPRINGFIELD CHAPTER

January 25—The meeting was called to order by President R. M. Potter and after the minutes of the previous meeting had been read, Mr. E. D. Kresse gave a complete report on the arrangements for a forthcoming dinner party to be held January 28th. According to the reports, arrangements seem to be going along very satisfactory, and a very good party is to be expected.



"Chieftain" Quality Built Compressors and Condensing Units

are designed to give you many years of quiet, efficient and trouble free service by Engineers who have been serving the refrigeration industry for the last fourteen years.

They have again "scored a hit" with a new "V" type four cylinder compressor which is designed for use with ½ to 1 HP motors. All of the advanced features that have proven so successful in "Chieftain" household and light commercial units are now incorporated in this new four cylinder model.

Mechanical improvements include, force feed lubrication to piston pin and connecting rod bearings, positive alignment of cylinder bores with main bearings by casting cylinders and crankcase in one piece. Adjustable suction shut-off valve, interchangeable parts with single and twin cylinder models. All compressor parts are machined to precision limits on up to date equipment and assembled in glass enclosed rooms where only filtered, dust free air is admitted.

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TECUMSEH PRODUCTS CO., Refrigeration Division TECUMSEH, MICH.

The meeting was then temporarily adjourned for the amusement of the evening, which consisted of the world's championship prize fight. However, since the fight was a pushover for champion Louis and the time required for it was so short, the meeting was not interrupted for very long.

After some additional business pertaining to the chapter, the balance of the evening was spent in round-table discussions.

February 8—After the business of the evening had been dispensed with, Mr. C. F. Linderman, the newly elected Educational Chairman, gave a lecture on refrigerants, covering SO_2, methyl chloride and Freon. This lecture was very much enjoyed by the membership, and as a future program Mr. Linderman suggested that the chapter plan a trip through the Hummer Mfg. Co.

Following the educational program, President Potter appointed Mr. Syl Grosberg and Mr. D. K. Burbank to assist Mr. Linderman on the educational program. Other committees appointed were the Membership Committee and the Investigating Committee.

February 22—The meeting was called to order by President R. M. Potter and after the correspondence and the minutes of the previous meeting had been read, various discussions arose among which was that on the suggestion of Mr. Beatty that the members establish a code of ethics which should be used for their future guidance.

WICHITA CHAPTER

January 6—The educational program featured a film entitled, "The Wonders of Chemistry," which portrayed among other things some very useful information on Drierite products. The film was both interesting and instructive and was very much enjoyed by all.

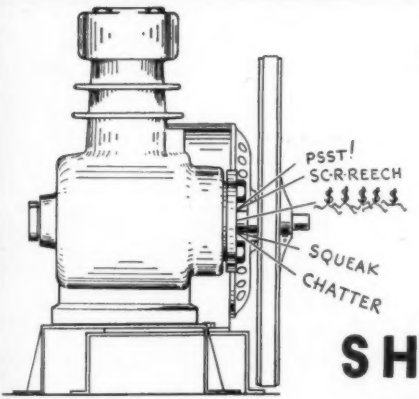
Since this was the first meeting of the year, an election of officers occupied the major part of the meeting and after following the usual routine of such elections, the results were as follows: F. W. Ryan, *president;* G. B. Govits, *vice-president;* F. H. Richards, *secretary;* E. F. Rhodes, *treasurer;* H. B. Till, *sergeant-at-arms; directors;* A. M. Wooldridge and H. P. Leeper.

January 20—President F. W. Ryan called the meeting to order and the minutes of the last meeting were read, and several visitors for the evening were introduced.

Two new members—Mr. R. I. Elgin and Mr. Frank Truax—were introduced and welcomed to the chapter.

Following this routine business, a discussion arose on the forthcoming inspection trip to a locker plant, which is being planned for the regular meeting night in February.

February 3—The meeting was opened in the regular meeting place and the business session of the evening was made as brief as possible so that as much time as possible



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could be devoted to the feature of the evening, which was a part of the educational program.

This feature was a trip to the Crystal Locker Storage Plant for an inspection of the equipment. The refrigerating plant is an ammonia job, operated with flooded coils. The entire trip proved very instructive and enjoyable.

The meeting was adjourned for the time required for this trip but was reconvened again after its completion.

The last order of business was a discussion of the membership drive and it was decided that this drive should be continued for another month.

February 17—During the course of the business meeting and after the usual correspondence and minutes were read, some discussion arose on future activities of the chapter. The plans included such things as a dinner or a picnic to be held in the coming season.

Letters from the Penn Electric Switch Co., the Detroit Lubricator Co., and the Fedders Mfg. Co., were read, offering their services during future meetings. It was decided that the Penn Electric Switch Co. should present a program on March 17th, and that the Detroit Lubricator Co. will have a representative present on March 27th.

The educational program of the evening consisted of a discussion led by Mr. Ryan on steam jet coolers. Mr. Ryan utilized a blackboard to illustrate his discussion.

PITTSBURGH CHAPTER

February 10—Mr. P. T. McCormack introduced the first speaker of the evening—Mr. John Allman of the Imperial Brass Mfg. Co. Mr. Allman outlined the policies and the history of the Imperial line and showed many samples of Imperial products. He also announced a tube bending contest which will be held in May under the auspices of the Joseph Woodwell Co., who are local distributors. Mr. Allman was thanked by Mr. Black for his interesting program.

The next speaker—Mr. D. O. Eggers of the White-Rodgers Co.—was introduced by Mr. H. S. McCloud. Mr. Eggers gave an interesting talk on their new line of solid liquid controls and illustrated his talk with a display of models of the control.

Mr. Eggers also offered to donate a prize for the tube bending contest. His offer was gratefully accepted by Mr. Black.

After some discussion on the examination for Certificate Membership it was decided to hold the examination on February 24th in the offices of Mr. J. K. Jackson.

New members in attendance who were introduced were Mr. K. M. Newcum and Mr. H. H. Lamar of the Superior Valve and

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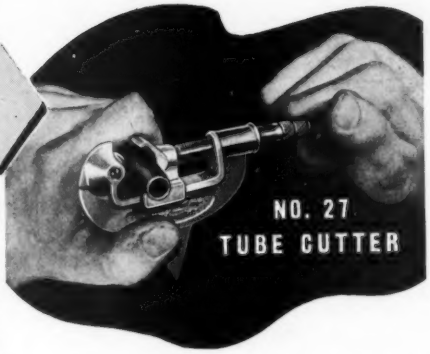

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Fittings Co., Messrs. C. V. Hale, P. N. Kimmell and H. R. Armbruster of the Melchior, Armstrong, Dessau Co. One of the visitors of the evening introduced was Mr. J. S. Forbes, the newly elected president of the Refrigeration Parts and Supplies Manufacturers' Assn.

DAYTON CHAPTER

February 3—Due to bad weather and the difficulty of getting to the meeting, there were very few in attendance. Consequently, very little business was conducted for the evening and the meeting was turned over almost immediately to Mr. H. Shoupp for the educational program. After Mr. Shoupp had entertained the membership to the extent of his program, informal discussions occupied the remainder of the evening.

February 17—The meeting was opened by President R. J. Brown, and after the regular routine of business was dispensed with, a complete report was given on the Valentine party held on February 14th. This was the first mixed party for the chapter and proved to be very successful.

Several members were unable to attend due to sickness but all in all the attendance was very good and an enjoyable time was had by all.

The ladies are requesting another party in the near future and are promising to cooperate with the chapter in the future to the extent of insisting on their husbands attending all regular meetings.

Future plans consist of a supper meeting to be held March 17th with the aim of securing at least two hundred service men in attendance. The educational plans for the evening include a representative of Peerless of America, Inc., as the principal speaker. It is expected that this will be a very enjoyable evening.

ROCKFORD CHAPTER

February 6—President R. C. McCarthy opened the meeting and one of the first orders of business was the drawing of the attendance prize. Mr. Charles Henley's name was drawn but as he was not present the prize was held over to accumulate with that of the next meeting, which will help to make it more attractive.

On completion of the evening's business the meeting was turned over to Mr. Fred Barney, educational chairman, who used as a basis of his evening's program a list of questions taken from THE REFRIGERATION SERVICE ENGINEER.

The dance committee reported favorable progress on the Valentine dance to be held on February 11th at the Harrisville Grange Hall.

February 20—After President McCarthy

had opened the meeting the drawing for the attendance prize produced the name of Walter Larson. Mr. Larson, however, was not present and the prize was added to that of the next drawing.

In the absence of Walter Larson, the Secretary gave a complete report on the Valentine dance held on February 11th, and from this report it was apparent that the dance was very successful.

Discussion followed on the possibility of forming a Ladies Auxiliary, and the Secretary was requested to write all members for their opinions on the matter.

The meeting was then turned over to Mr. Fred Barney, chairman of the Educational Committee, who passed out some literature to those present and proceeded to discuss its contents.

SAN DIEGO CHAPTER

January 25—The major part of the evening was devoted to the installation of the new 1939 officers.

Mr. R. L. Darby of Long Beach, Calif., member of the National Board of Directors, officiated in this routine, and the new officers, as follows, were installed: E. L. Dick, *president;* Otto Williamson, *vice-president;* C. H. Atkinson; *secretary;* Richard Truxell, *treasurer;* W. E. Johnson, *sergeant-at-arms.*

TRI-COUNTY CHAPTER

January 6—Because this was the annual meeting it was celebrated with a dinner which was the first event of the evening. This dinner also served as the Membership Contest banquet.

The greater part of the business session was devoted to the election of new officers. The annual reports of the Secretary and Treasurer were read and approved, and President E. White gave his report of past events, thanking the members for their co-operation during his period of office.

A Nominating Committee, previously appointed, then retired to make their selection and the meeting was recessed until they were ready to make their report. After the usual procedure of such elections, the outcome was as follows: Wm. Metcalf, *president;* Willis Stafford, *vice-president;* M. Reichenbacher, *secretary-treasurer;* B. V. Clark, *sergeant-at-arms.*

February 3—Newly elected President W. Metcalf opened the meeting and the usual routine of business was dispensed with.

Mr. Stafford then gave a complete report of the activities of the Illinois State Association meeting held in conjunction with the All-Industry exhibition in Chicago on January 18th.

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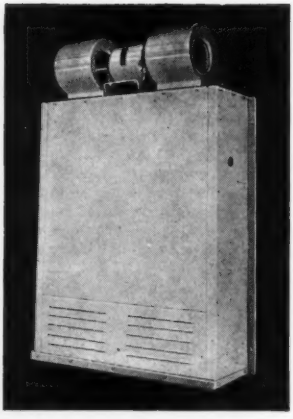

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The educational program of the evening consisted of a very interesting talk entitled, "The Service Man's Problems," by Mr. Merle Sayler of the Refrigeration Maintenance Co. of Chicago.

CENTRAL INDIANA CHAPTER

February 7—The meeting was opened by President F. Whetsel, who introduced and welcomed visitors of the evening, including Mr. Glen Young, Mr. Clark, and Mr. Holloway of Muncie, Ind., and Mr. Rowland Shaffer of LaFontaine, Ind.

The Question Box was the next order of business and was found to be quite crowded, and an interesting time was had in the many fine answers that were given.

Arrangements were discussed and complete for a party to be held February 12th at the Paul Jacobsen residence.

It was rumored that Mr. Herbert Hale of Kokomo has promised to bring ten gallons of ice cream for the occasion.

February 12—This was primarily a social meeting, which was held in the home of Paul Jacobsen. Among those present were Mr. and Mrs. Rogers of Anderson, Mr. Hale of Kokomo, Mrs. Nold of Marion, Mr. and Mrs. Sevy of Wabash, Mr. and Mrs. Morris of Marion, Mr. and Mrs. Jacobsen and daughter Lois, Mr. and Mrs. Shaffer of LaFontaine sent their proxy in the form of a large cake and their regrets at being unable to attend.

Games were played and many eats were consumed. The party continued until two a. m., Monday morning, at which time it found that Mrs. Sevy was sound asleep but still winning in the Chinese Checker game.

Herbert Hale made the greatest mistake of the evening in bringing ten gallons of doughnuts instead of ice cream. One of the outside interferences of the evening consisted of Paul's chickens which crowed all night.

ST. LOUIS CHAPTER

January 26—The meeting was held at the Brass & Copper Sales Co. offices at 2817 Laclede Avenue, and was called to order by President A. H. Huhn.

Mr. O. A. Friemal gave an interesting talk and description of the Lul Coil Fabricating Machine and Mr. Chas. Wunderlich put the machine through its various operations, actually fabricating a coil for the benefit of those present.

Other equipment such as hydraulic cutting machines, and a mechanical tube cutter were then shown under operation and explained. This, together with an inspection of the complete stock of standard replacements

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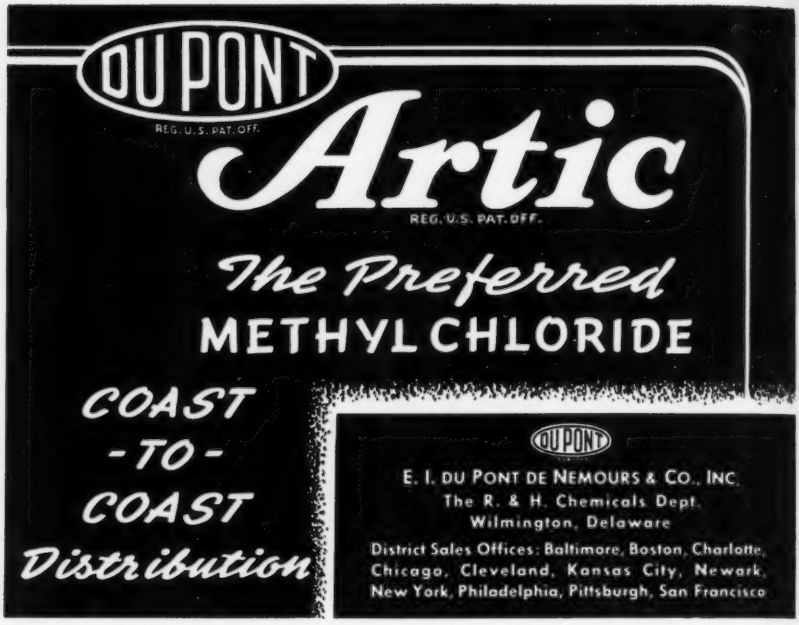

parts concluded the evening's inspection trip.

Following this trip, refreshments were served under the very able direction of Mr. Manuel Brown of the Brass & Copper Sales Co., a member of the chapter.

February 9—The meeting was called to order by President A. H. Huhn in the chapter's new meeting quarters in the Kings-Way Hotel.

A discussion on the matter during the latter part of the meeting brought out a unanimous decision to continue to hold the meetings in these quarters.

Mr. O. E. Petri, second vice-president, was congratulated during the meeting on the arrival of a baby boy.

The educational feature of the evening consisted of a talk by Mr. N. H. Behrend, member of the Board of Directors, on the testing of oil for moisture content.

Following the educational program, Mr. Gygax gave a comprehensive outline of what can be expected at the next meeting.

February 23—In order that the speaker on the educational program should be given as much time as possible, the business of the evening was made very brief.

Mr. F. B. Fillo of the White-Rodgers Co. of St. Louis, was the speaker of the evening and gave a very interesting and complete talk on their line of hydraulic action refrigerator controls and illustrated his talk with an exhibition of their equipment.

After a brief recess following the talk, the meeting was opened to questions and answers.

Following this period, the meeting was thrown open for additional business of the chapter.

Mr. Gygax announced that the Penn Electric Switch Co. would supply the educational feature of the next meeting and called attention to the forthcoming refrigeration exhibit being sponsored by the R. E. Thompson Co. on Friday and Saturday, March 3rd and 4th at the Hotel Kings-Way.

MISSISSIPPI VALLEY CHAPTER

January 27—Considerable time was devoted during the course of this meeting to plans and arrangements for the forthcoming annual banquet and entertainment which is to take place on Saturday evening, February 18th.

Mr. Brainard was appointed chairman of the Booklet Committee for tri-city area.

Further reports revealed that considerable publicity had been given the banquet, and that invitations to attend had been extended to other chapters as well as individuals in nearby cities. A large turnout is expected.

During a discussion of future meetings it was announced that Mr. Glen Swails of Iowa

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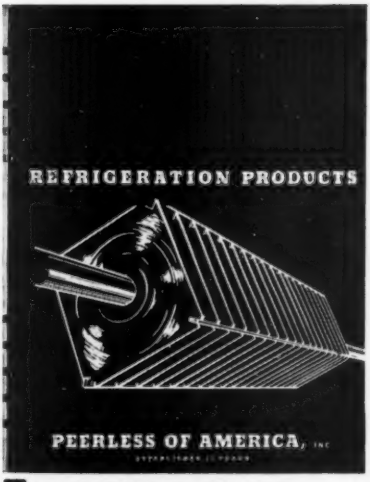

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City would present some very interesting information on forced draft units for low temperature work at the meeting of February 24th. A door prize is to be given at this meeting, and the Republic Electric Co. advised that they would stand part of the expense of the prize.

The Alco Valve Co. representative will be the guest speaker during the meeting of February 10th. He will demonstrate the glass evaporator built by Alco.

February 10—At this meeting the chapter members were happy to have with them Mr. J. A. Schenk of the Alco Valve Co. He had with him a glass evaporator and a very interesting demonstration was conducted for the benefit of those present. Mr. Schenk also spoke on various other Alco products and illustrated his talk with pictures.

INDIANAPOLIS CHAPTER

February 14—The meeting was called to order by the president, Mr. H. Klepfer.

The debating between the members of the chapter which was scheduled for this meeting was omitted to give the members the opportunity of hearing Mr. Jack Searle of the White-Rodgers Co. give a very delightful talk on the White-Rodgers line of controls. Mr. Searle answered all questions of the members and also furnished some very interesting samples of their line.

All business was postponed until the meeting of February 28th.

KANSAS CITY CHAPTER

January 10—Since this was the first meeting of the new year, the business session was devoted entirely to cleaning up old business and to annual reports of the Secretary, the Treasurer and the Auditing Committee.

Next, the election of officers took place, and was conducted in the usual manner with the following results: J. P. DeWilde, *president;* H. F. Andrews, *1st vice-president;* F. A. Thompson, *2nd vice-president;* O. R. Irwin, *secretary;* E. Bloesser, *treasurer;* A. Fromholtz, *sergeant-at-arms; directors:* A. M. Hoover, C. L. Hataway and T. L. Anderson.

January 24—The meeting was called to order by President J. DeWilde.

A report from the Educational Chairman announced that the air conditioning lectures would be started on January 31st and would continue every Tuesday night for a period of six weeks. He urged all members to participate in this educational feature.

Mr. Hataway and his team was announced as the winner of the membership drive contest, which meant that according to previous

agreement Mr. Bloesser and his team would have to entertain the winning team at a future date.

Members were again reminded of the special educational features to be covered by the Richards-Conover Hardware Co., Kelvinator distributor, and were again urged to take advantage of their invitation to attend.

Mr. Tramposh gave an interesting report on the Refrigeration and Air Conditioning Exposition held in Chicago January 16-19.

* * *

INTERSTATE MACHINERY AND SUPPLY CO. DISPLAY

DURING the two days of February 23 and 24, the Interstate Machinery and Supply Co., of Omaha, Nebraska, conducted a very successful display of refrigeration and air conditioning parts and supplies. Among those manufacturers who had representatives present, and who exhibited their products, were:

Imperial Brass Mfg. Co.
Penn Electric Switch Co.
Superior Valve & Fittings Co.
American Radiator Co.
Chicago Metal Hose Co.
Mueller Brass Co.
Peerless of America, Inc.
Spoehrer-Lange Co.
Modern Equipment Corp.
Alco Valve Co.
Henry Valve Co.
Automatic Products Co.
Detroit Lubricator Co.
Kold-Hold Mfg. Co.

The attendance for the two days was far beyond expectations, and the interest created was well demonstrated by the fact that it was found impossible to close the display much before midnight each night.

One of the interesting features of the show was a tube bending contest, conducted by Mr. Chas. Anderson, of the Imperial Brass Mfg. Co. Eight contestants entered the contest, and the winner not only completed the project in the shortest time, but turned in the most perfect model.

Another interesting feature were the movies shown by Mr. M. W. Knight, of Peerless of America, Inc. The first picture shown portrayed the manufacture of Peerless coils and views of the factory. The second consisted of interesting views taken by Mr. Knight during a recent trip through Mexico.

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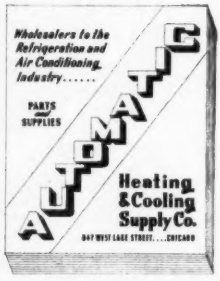
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FEDDERS INTRODUCES NEW ITEMS AT THE ALL-INDUSTRY EXHIBITION

FEDDERS MFG. CO. introduced a number of new products at the All-Industry Exhibition. These include the new 381 thermostatic expansion valves, household evaporators, heat exchangers, oil separators, and a new wall type convection unit.

The 381 thermostatic valve features a compact design with drop forged brass body with a hermetically sealed power element housing of stainless steel. Both valve and power element bellows are hydraulic process assuring uniform wall thickness. Bellows have 60 percent greater area than previous types. A new improved power element assures accurate control and faster response to temperature change in the suction line. Power element contains Fedders' vapor charge which assures positive operation over the entire range of working temperatures. Outlet opening is arranged to afford inspection of needle and seat. Inlet has ample screen of suitable mesh. Adjustment is made on valve stem under acorn nut on bottom of valve. A non-adjustable type is also available, set for 10 degrees superheat for standard conditions of operation where a non-adjustable type is preferred.

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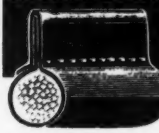

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midity. Compact design allows maximum storage space in the fixture. Cooling element is of Fedders high efficiency all copper located inside the cabinet below the fan; heat exchanger is included as standard equipment. Cabinets are rust-proofed and finished in white Dulux to conform with cabinet interiors. This type of equipment is not recommended for temperatures of less than 36 degrees F. Motor fans are designed to operate continuously, and only require attention for oiling occasionally.

NEW ENGLAND JOBBERS SPONSOR REGIONAL EXHIBIT

THE first annual New England Refrigeration Parts and Supplies Show will be held on March 24 and 25, at the Hotel Charles, Springfield, Mass.

The exhibit will be open on Friday from 1:00 p. m. until 9:00 p. m., and on Saturday from 10:00 a. m. until 9:00 p. m. Admission will be by ticket, which can be secured from any of the participating jobbers, and will be confined to service engineers and the trade only.

The products of some fifty manufacturers will be shown. A tube bending contest is being arranged for Saturday afternoon.

Members of the New England Jobbers' Association, sponsoring this exhibit, include: A. E. Borden Co., Boston, Mass.; Marsden & Wasserman, Inc., Hartford, Conn.; Melchior, Armstrong, Dessau Co., Boston, Mass.; National Accessories Corp., Springfield, Mass.; Parsons Bros., Bridgeport, Conn.; Carl P. Payson Co., Springfield, Mass.; Resco, Inc., New Haven, Conn.; Rhode Island Supply & Engineering Co., Providence, R. I.; Standard Supply Co., Worcester, Mass.

KRAMER NAMED HEAD OF H. CHANNON COMPANY

RALPH E. KRAMER, who became associated with H. Channon Company in September, 1935, as assistant sales manager, last week became president of the firm. Previous to this promotion he was vice president.

Following his graduation from Carnegie Institute of Technology, Mr. Kramer spent the next two years with the Inca Mining and Development Company of South America. Prior to joining H. Channon Company, he

was with the Sullivan Machinery Company for 11 years.

H. Channon Company recently became distributors for Perham Products, Inc.,

RALPH E. KRAMER

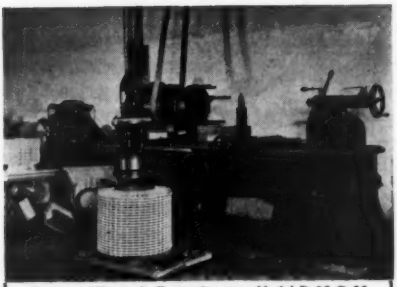
manufacturers of a new year-round air conditioning unit for offices, hotels and factories.

* * *

PREVENTS ICE AT EXPANSION VALVE

ICE-X, recently announced by the Ansul Chemical Co., of Marinette, Wis., is the result of extended research of the Ansul laboratories. It has been thoroughly tested under actual field operations and is claimed to: eliminate ice at expansion valves; give immediate relief from ice trouble; dissolve ice, thus preventing ice formation; noncorrosive—not containing methyl alcohol, ethyl alcohol, alkali, acid or other corrosives; does not react with refrigerants; has no effect on oil; leaves no residue upon evaporation; safe in use—free of any hazard to life or health; may be used with acrolein methyl; is equally effective with methyl chloride, methylene chloride and "Freon."

The tests under which Ice-X has been placed are described in the Ansul Bulletin.



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Domestic Cold Controls (Modern Type)	2.00
Commercial Controls (Temp. or Pressure)	2.50
Commercial Dual Controls	3.00

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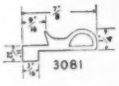

The gasket illustrated was made especially for FRIGIDAIRE replacement. It fits. ALL JARROW gaskets are built to Manufacturers' specifications. INSIST on JARROW gaskets. Your nearest Jobber has them.

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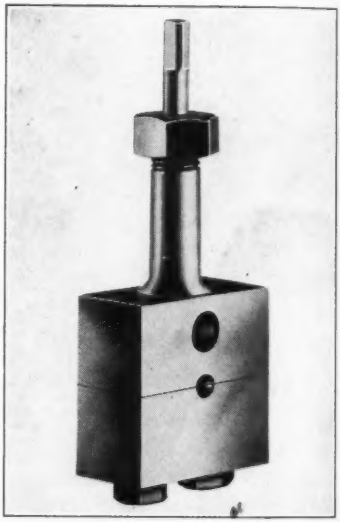
ANNOUNCING A NEW TOOL FOR REFRIGERATION SERVICE MEN

THIS by-pass tool was developed to meet the requirements of up-to-date service men. A partially or completely clogged strainer in a liquid line often takes much of your valuable time in pumping down systems. Pinch-off tools leave the tubing in a weakened condition.

To use this by-pass tool, simply clamp on liquid line near receiver, connect ¼ inch line to tool and place compound gauge in line to low side of compressor. Be sure there are no leaks. Open low side valve and draw 10 or 15 inch vacuum. Turn valve



THIS IS A NEW TOOL DESIGNED BY A SERVICE COMPANY FOR THE SERVICE ENGINEER.

stem on tool down until it punctures the line and back off until liquid discharges back through low side. Back pressure can be controlled by tool.

When zero lbs. has been reached, the line can be dismantled and strainers cleaned.

After repair has been made simply cut off line back of puncture and reflare.

No more coughing or sneezing from SO_2 when cleaning strainers. You save all the gas. Service men who have used this tool would not be without it.

REFRIGERATING DATA BOOK

THE Refrigerating Data Book, now widely used by men in every branch of refrigeration and air conditioning, appeared again in the Fourth Edition on February 1, with much new material and all data brought up-to-date in line with the newest developments and practice in these fields. As in previous editions, the men whose combined efforts result in the finished Data Book comprise a cross-section of the best talent in the refrigeration and air conditioning industry.

Many chapters have been rewritten for this edition in order that the entire contents be up-to-date. These new chapters include data on compression systems, absorption systems, dry ice, fluid flow, refrigerant properties, insulation, cork, small air conditioning systems, air systems, surface coolers, fruits and vegetables, dairy products, sea foods, freezing of foods, ozone and ultra-violet light, domestic refrigerators, condensing units, commercial evaporators, and four chapters on the newest designs and practice in controls.

A new feature of great practical value is the inclusion at the end of a number of chapters, of specification tables, giving the dimensions, capacities and other facts about existing equipment.

The price of the Data Book remains the same, four dollars per copy in the United States and four and one-half dollars elsewhere. Copies may be ordered from Nickerson & Collins Co., 433 N. Waller Ave., Chicago, Ill.

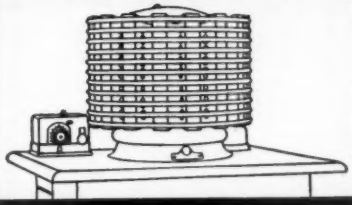
S S S

NEW CATALOGS AND BULLETINS

AUTOMATIC HEATING & COOLING SUPPLY Co., 647 W. Lake St., Chicago, Ill., has announced the issuance of their new spring catalog. They have informed us that this catalog has been made so complete that it will become a reference book for the entire refrigeration and air conditioning industry.

Many months of research and preparation have resulted in the anticipation of every requirement of the industry. They have endeavored, in this new catalog, to illustrate and describe fully, every item that could possibly be demanded of them.

Of course the circulation will be strictly



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POSITION WANTED—Steady job with air conditioning or electric refrigeration concern. To start, will do any work available. Salary not less than $35.00 per week. Have four years' experience installing, servicing small commercial and domestic refrigerators; eight years' experience on 400-horsepower heating, ventilating plant. Location optional. References. Address Harry Hudson, 96 Nassau Blvd. South, Garden City, New York.

BOOKS FOR SALE—Write to Nickerson & Collins Co. for a complete list of books on Air Conditioning, Refrigeration, Ice Making, Cold Storage, Food Handling, Heating, Diesel, Oil, and Steam Engines, Domestic and Small Commercial Machines, and others. These are the best books published today on Refrigeration and related subjects. Nickerson & Collins Co., 435 N. Waller Ave., Chicago, Ill.

guarded and no copies will be issued to anyone but those entitled to it because of their active participation in the refrigeration and air-conditioning industry.

COVER OF NEW CATALOG.

They announce that this catalog will be ready about April 1st and that it will contain 200 pages. It will surely be worthwhile for everyone in the industry to have one.

H. W. Blythe Co., Catalog No. 39 is nearing completion as we go to press and will be ready for mailing by March 20.

Realizing the importance of having information in the hands of the trade on the many new items which have been developed since the issuance of their last catalog, the Blythe Co. are bringing out this new catalog thirty days earlier than a year ago. They feel that there is every indication of an earlier and better "refrigeration season" than last year and have prepared themselves, by increased stocks and delivery facilities, to meet these anticipated demands.

In addition to the many new items in this much larger catalog the Blythe Co. are exclusive distributors in the Chicago district for the well known Par condensing units manufactured by Modern Equipment Corporation. A very complete coverage of refrigeration and air-conditioning needs is offered in sizes ranging from ¼ h.p. units for small commercial requirements to 20 h.p. highsides for air-conditioning applications.

The policy of showing only list prices in this catalog is being continued and a confidential discount sheet, which can be easily removed, is inserted as a flyleaf and can be placed in the confidential files of the service company. This enables them to use Blythe's catalog in sales promotion work.

In order to keep this catalog in legiti-

mate trade channels it is requested that you send in your request for one on a letterhead or accompanied by a business card showing your connection with the industry. Such inquiries addressed to H. W. Blythe Co. at 2334 S. Michigan Ave., Chicago, Ill., will be answered promptly.

HERMAN GOLDBERG CO. MOVES

OCCUPYING more spacious quarters to facilitate service to an increasing clientele, the Herman Goldberg Co. has moved to the modern Civic Opera Bldg., at 20 N. Wacker Drive, Chicago, Ill.

J. M. SCHLEMMER TO VISIT WORLD'S FAIR

J. M. SCHLEMMER, shop foreman of Rex Refrigeration Service, Inc., Chicago, left February 15 for a six weeks' trip to California.

Not much is known about this trip, but it is rumored that Schlemmer is making a cross-country test on that new scooter built by Arnold Schroeder and himself.

While in California, Mr. Schlemmer plans on visiting Los Angeles and San Francisco, spending several days visiting the World's Fair.

J. G. GOEBEL NOW WITH REPUBLIC ELECTRIC

THE Republic Electric Company of Davenport, Iowa, refrigeration supply jobbers of eastern Iowa and western Illinois, have recently hired Mr. John G. Goebel to act as their territory representative. Mr. Goebel will travel throughout eastern Iowa and western Illinois.

W. F. HAUBER JOINS VINCENT BRASS

W. F. HAUBER, formerly with Automatic Heating and Cooling Supply Co., Chicago, Ill., is now in charge of the Refrigeration Supply Dept. of the Vincent Brass & Copper Co., Minneapolis, Minn.

According to the announcement made by Mr. R. L. Vincent, president of the company, Mr. Hauber joined the Vincent Brass & Copper Co., in November 1938.

"THAT'S *what I call* SERVICE!"

All the way along the line, the manufacturing and distribution operations behind V-Meth-L and Extra Dry Esotoo are geared to the highest ideals of Service. Exceptional purity of product, combined with swift, dependable delivery from the nearest of our many conveniently located stock branches represents service to you of the greatest importance. In addition, the long-time experience of our Chemical Engineers in the many problems of handling refrigerants enables us to advise you on the safest, simplest, quickest methods of dehydrating and transferring. You get better service, and you can *give* better service—with Virginia Smelting products.

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Index to Advertisements

Airco Refrigeration Parts 52
Airo Supply Co. 60
Alco Valve Co. 00
Alter Co., The Harry 62
Aluminum Ore Co. 5
Ansul Chemical Co. 43
Automatic Heating & Cooling Supply Co. 52
Automatic Products Co. 7

Berdor Electric Co. 58
Blythe Co., H. W. 58
Bonney Forge & Tool Works ..... Back Cover

Channon Co., H. 55
Chicago Eye Shield Co. 54
Chicago-Wilcox Mfg. Co. 58
Commercial Coil & Refrigeration Co. 56
Complete Electric Supply Co. 59
Cook Co., The 54

Dennis & Co., W. J. 54
Detroit Lubricator Co. 10

Electrimatic Corp., The 00

Fedders Manufacturing Co. ..... 32 and 33
Flushing Refrigeration Co. 57

General Electric Co. 6
General Electrical Refrigerator Service 59
Gilmer Co., L. H. 46
Goldberg Co., Herman 00

Hammond Drierite Co., W. A. 53
Henry Valve Co. ..... Inside Back Cover

Imperial Brass Manufacturing Co. ..... 2 and 3

Jarrow Products Corp. 57

Kerotest Manufacturing Co. ..... 40 and 41

Maguire Co., Wm. F. 58
Manufacturers Fin Coil Co. 00
Marlo Coil Co. 48
Marsh Corp., James P. 00
Mills Novelty Co. 42
Modern Equipment Corp. 1
Mueller Brass Co. 39

New Duty 57

Peerless of America, Inc. 51
Penn Electric Switch Co. 00
Practical Instrument Co. 49

Ranco, Inc. 8
R. & H. Chemicals Dept. 50
Refrigeration Service, Inc. 59
Refrigeration Supplies Co., Ltd. 56
Rempe Co. 55
Rex Refrigeration Service, Inc. 52
Rotary Seal Co. ..... Inside Front Cover

Snap-on Tools Corp. 47
Spoehrer-Lange Co. 63
Syntron Co. 45

Tecumseh Products Co. 44
Trenton Auto Radiator Works 63

Utilities Engineering Institute 53

Virginia Smelting Co. 61

Wants, etc. 60
Weatherhead Co., The 4

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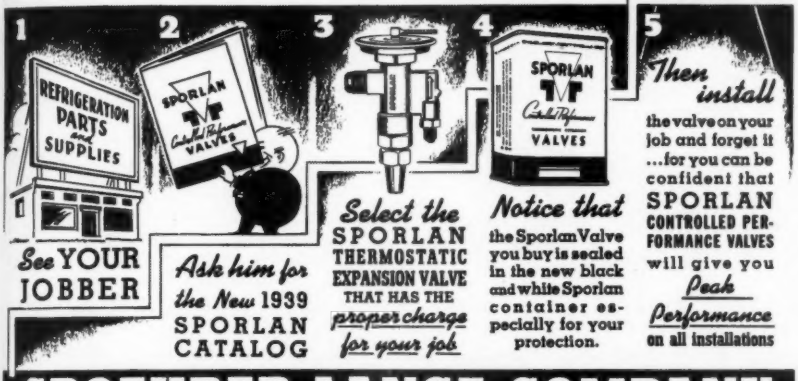
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Ask him for the New 1939 SPORLAN CATALOG
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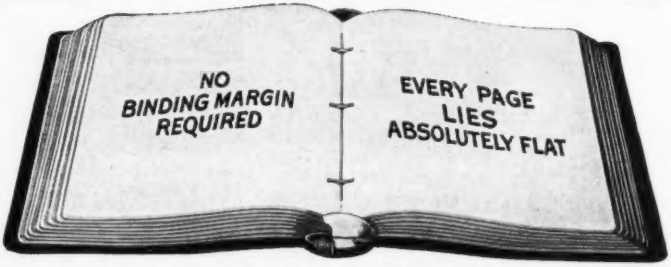

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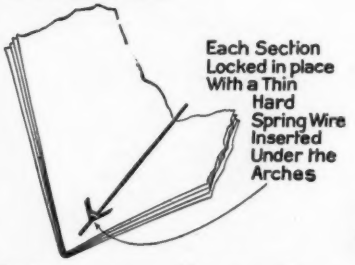

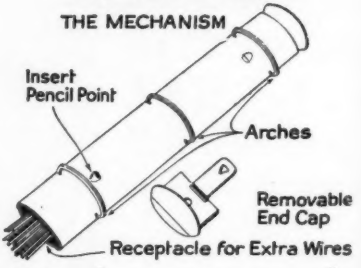

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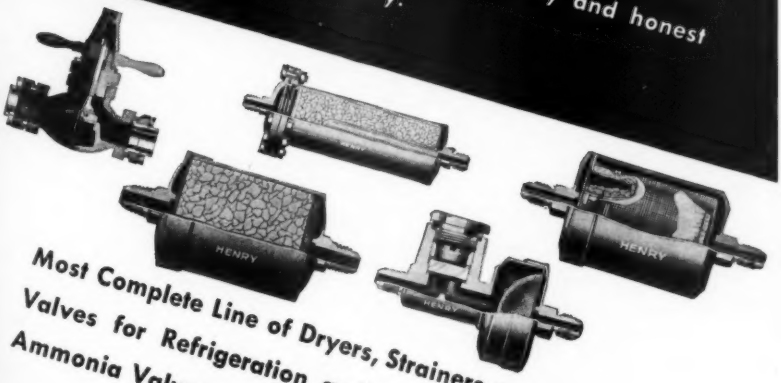

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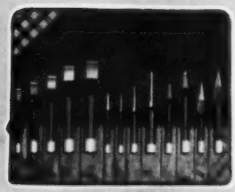

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